Scientific Bulletin
of Mukachevo State University

Series
Economics

Volume 13, No. 2, 84-100
Journal homepage: https://economics-msu.com.ua/en

ISSN 2313-8114
E-ISSN 2518-1254

UDC 339.9:502.131.1:338.1(1-773)
DOI: 10.52566/msu-econ2.2026.84

Business environment for jobs, investments and exporting: The real effects of EU green transitions on developing countries

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Abstract. The aim of this study was to assess the impact of the EU's environmental transformation on the economic development of developing countries in the context of employment, investment activity and foreign trade. The research

Received: 11.01.2026, Revised: 20.04.2026, Accepted: 25.05.2026, Published: 29.05.2026

Suggested Citation: Gulmaliyeva, N., Babayev, R., Ismayilzada, G., Huseynova, L., & Isayev, E. (2026). Business environment for jobs, investments and exporting: The real effects of EU green transitions on developing countries. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 13(2), 84-100. doi: 10.52566/msu-econ2.2026.84.

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methodology was based on comparative, statistical and scenario analysis, as well as methods of analysis and generalisation. The results showed that carbon dioxide emissions in the United Kingdom decreased by almost 29% and in Germany by 28%, while in Vietnam they increased by 106%, in Indonesia by 63% and in India by almost 49%, indicating a shift of carbon-intensive production to emerging markets. Exports from Africa to the EU increased from EUR 136 billion in 2019 to EUR 189 billion in 2024, while imports from Central Asia reached EUR 35.1 billion. Scenario analysis showed that export losses could exceed EUR 7.5 billion for Africa and EUR 1.4 billion for Central Asia under the pessimistic scenario. Renewable energy capacity in Africa could reach 96-99 gigawatts by 2030, while in Kazakhstan it could increase to almost 4 gigawatts. The study found that the European Green Deal increased trade risks for carbon-intensive sectors while stimulating renewable energy development and low-carbon industrial modernisation. The practical significance of the study is the possibility of using the results by public authorities, exporters, industrial enterprises and investors for assessing the risks of the Carbon Border Adjustment Mechanism and planning low-carbon industrial modernisation

Keywords: Carbon Border Adjustment Mechanism; foreign direct investment; decarbonisation; industrialisation; climate policy; global value chains

Introduction

The intensification of EU climate policy transforms international trade, investment flows and industrial regulation, increasingly affecting developing countries. The implementation of the European Green Deal, the Carbon Border Adjustment Mechanism (CBAM) and decarbonisation requirements creates new conditions for access to the European market and changes the competitive environment for exporters from developing economies. The EU's green transition increases the need to assess its economic consequences for developing countries, particularly in employment, export competitiveness and industrial modernisation. R.R. Dadashli (2024) analysed the EU's support for Azerbaijan's transition to a green economy within the EU4Environment and EU4Climate programmes. The study found that cooperation with the EU contributed to renewable energy legislation, energy efficiency standards, green infrastructure and renewable energy exports to European markets.

The growing role of green energy corridors and environmental modernisation projects in strengthening economic interaction between Azerbaijan and the EU was also identified. The impact of the green transition on economic growth, innovative development, energy efficiency and investment processes was studied by G.H. Popescu *et al.* (2025), who analysed the relationship between green investments, renewable energy, environmental policy and the competitiveness of EU economies. The results obtained showed that investments in green infrastructure, research and development (R&D), energy efficiency and renewable energy contribute to technological modernisation and circular economy development.

Economic decarbonisation, environmental regulation and the transition to low-carbon development models create challenges for countries dependent on industrial production, fossil fuels and foreign investment. P. Mitić *et al.* (2024) studied the relationship between carbon dioxide emissions, industrialisation, financial development and electricity generation in Central and Eastern Europe during 1995-2021. The results obtained showed a long-term relationship between industrialisation and CO_2 emissions, while industrial growth and dependence on fossil fuels increase the environmental burden and complicate decarburisation. The specifics of implementing the green transition within the EU cohesion policy were studied by L. Tijanić & I. Kersan-Škabić (2025), who analysed financing mechanisms through the European Structural and Investment Funds (ESIFs), as well as investments in the low-carbon economy, energy efficiency, renewable energy and climate adaptation. The study showed that investments in green infrastructure and ecological modernisation contributed to energy efficiency, greenhouse gas emission reduction, renewable energy expansion and structural transformation of EU economies.

The growing role of the service sector in the international economy and the spread of ecological transformation create new conditions for the economic development of developing countries, especially in employment, investment, digitalisation and integration into global value chains. The relationship between the development of the service sector, the green economy and the structural transformation of developing economies was studied by P. Ström (2024), who analysed the role of digital services, servitisation, global production networks and knowledge-intensive services in ensuring sustainable economic development. The relationship between innovative activity, the green economy and sustainable development was studied by A. Kwilinski *et al.* (2025), who analysed the impact of innovation, research and development (R&D) spending, high-tech trade and patent activity on the green economic growth of the Visegrad Group countries in 2007-2022. The results obtained showed that investments in research and development, high-tech exports, digitalisation and environmental technologies contribute to increasing energy efficiency, renewable energy development and economic competitiveness.

Environmental trade regulation and sustainable development standards create new conditions for the global economy, affecting investment activity, export competitiveness and transformation of developing countries. S. Mubin & A.H.A. Putri (2025) analysed the role of CBAM, environmental trade standards and mechanisms for spreading

environmental norms in the global trading system. The results obtained showed that the European Green Deal contributes to international trade transformation through stricter environmental import requirements, low-carbon supply chains, green industrialisation and investments in clean technologies. The impact of the European Investment Bank's environmental and social standards on green projects outside the EU was studied by S. de Simone *et al.* (2025), who analysed the role of the European Investment Bank (EIB) in promoting a just transition through Environmental and Social Impact Assessments (ESIAs) within the European Green Deal. The study showed that environmental and social financing criteria increase attention to environmental justice, inclusiveness, social protection and assessment of infrastructure projects' impact on local communities.

At the same time, insufficient attention has been paid to assessing the impact of the EU's green transition on employment, export competitiveness, international investment flows and the adaptation of the business environment in developing countries. The aim of this study was to determine the effects of the EU's green transition mechanisms on export competitiveness, investment processes and employment transformation in developing countries. To achieve this goal, the following tasks were defined: to analyse the main mechanisms of the EU's green transition and their impact on international economic relations; to assess the impact of the EU's environmental trade and investment requirements on export competitiveness, investment transformation and the adaptation of the business environment in developing countries.

Materials and Methods

The study was predominantly theoretical in nature with the use of individual empirical analysis elements. The main time period of the study covered the years 2019-2025. The period 2019-2024 was chosen to analyse the dynamics of trade between Africa and the EU due to the availability of statistical data, the possibility of covering the period before the active implementation of the European Green Deal, the consequences of the COVID-19 pandemic and the further strengthening of environmental regulation of the EU. The period 2020-2024 was used to analyse trade and economic cooperation between the EU and the countries of Central Asia, since it was after the COVID-19 pandemic that the region observed a gradual recovery of trade flows and an increase in the impact of CBAM and EU environmental standards on export-orientated sectors. The time period 2014-2024 was used to analyse the dynamics of CO_2 emissions, which made it possible to assess long-term changes in the global distribution of carbon-intensive production and the processes of transferring industrial production to emerging markets. Separate statistical and forecast indicators for 2025 were used to assess current trends in the development of renewable energy infrastructure, green industrial projects and scenario consequences of the European Green Deal for developing countries.

The analysis of regulatory and analytical documents of the EU, including The European Green Deal (n.d.), Regulation (EU) No. 2021/1119 of the European Parliament and of the Council (2021) and European Union Emissions Trading System (EU ETS, n.d.), was used to study the transformation of international economic policy, global trade regulation and the development of a low-carbon economy. The method of analysis and systematisation was also applied to examine Regulation (EU) No. 2024/1735 of the European Parliament and of the Council (2024), Regulation (EU) No. 2024/1252 of the European Parliament and of the Council (2024) and the Green Deal Industrial Plan (EUR-Lex, 2023)/Clean Industrial Deal (n.d.) according to the criteria of main objectives, key instruments and influence on international economic relations to determine their impact on international trade, investment flows and adaptation to low-carbon standards. The same method was used to study the Carbon Border Adjustment Mechanism (n.d.), Regulation on Deforestation-free Products (EUDR) (n.d.) and EU Taxonomy for Sustainable Activities (2026) to determine their influence on environmental regulation of international trade and global value chains.

The method of analysis of statistical and analytical sources was used to study the transformation of global value chains, changes in CO_2 emissions in 2014-2024, the transfer of carbon-intensive production to emerging markets and the transformation of investment flows in African countries under the influence of the EU's green transition. Statistical sources, reports of international organisations and project documents were used to determine the impact of environmental regulation on international production, supply chains, renewable energy development and low-carbon industrial transformation (International Renewable Energy Agency, 2025; Velyka, 2026; Jowett, 2026). Analysis of analytical documents of the World Trade Organization (WTO) (2025), the Organisation for Economic Co-operation and Development (OECD, 2025) and the United Nations Conference on Trade and Development (UNCTAD, 2025) was used to study approaches to the coordination of trade, environmental and investment policies in the context of the low-carbon transformation of the world economy. The method of analysis and generalisation was applied to assess the impact of the CBAM on export competitiveness, adaptation of carbon-intensive industries, renewable energy development and the spread of cleaner production technologies in international trade. Analytical and project materials related to renewable energy, geothermal energy, green hydrogen initiatives and the Noor Ouarzazate I Concentrated Solar Power Independent Power Project (NOORo I CSP IPP) were used to identify directions of low-carbon industrial modernisation and renewable energy infrastructure development in African countries (NOORo I CSP IPP, n.d.; UNCTAD, 2021).

Country and sectoral analytical materials were also used to assess the impact of the green transition on renewable energy development, green infrastructure, and climate finance and clean technologies in Africa and Central Asia.

The method of analysis and generalisation was applied to identify changes in the structure of investment, industrial production and export competitiveness, as well as risks for energy-intensive industries and sectors dependent on fossil fuels in Central Asia and Africa. Kazakhstan and Azerbaijan were selected for a more detailed analysis due to the significant role of carbon-intensive exports in their trade relations with the EU (Park *et al.,* 2023; World Bank, n.d.). Separate country analytical materials were used to assess changes in the structure of energy exports and international investment flows in Azerbaijan (World Bank, 2022). Turkmenistan, Uzbekistan, Kyrgyzstan and Tajikistan were considered at a general review level to identify common regional risks related to fossil-fuel dependence and carbon-intensive production (EU and Central Asia, n.d.). South Africa, Egypt, Morocco, Kenya, Ethiopia, Namibia, Mauritius and Tunisia were also reviewed to illustrate regional trends in renewable energy development, green industrialisation and sustainable infrastructure projects (Freitas & Mwaniki, 2024; Ebatamehi, 2025). The comparative analysis method was used to examine the transformation of export-orientated sectors and the investment environment under the influence of the EU Green Transition and the CBAM. The analysis was conducted according to the criteria of carbon intensity, exposure to EU environmental requirements, investment adaptation mechanisms and directions of industrial modernisation. Particular attention was paid to metallurgy, aluminium production, fertilisers, energy, renewable energy and low-carbon manufacturing. Uzbekistan, South Africa, Morocco, Egypt and the least developed countries of Africa were additionally considered at a general review level to illustrate broader regional differences in adaptation to low-carbon standards, climate finance and green investments.

The analysis and synthesis method were applied to analytical and project documents related to renewable energy and sustainable infrastructure projects in Central Asia. For Kazakhstan, renewable energy facilities, the Mirny (TotalEnergies, n.d.) wind farm and investments in battery storage systems were studied to determine the impact of EU environmental standards on energy modernisation and investment transformation (Hernandez & Rabiega, 2026). For Kyrgyzstan, the Kambarata-1 Hydropower Project (n.d.) and international financing mechanisms for energy infrastructure were analysed to assess the development of sustainable infrastructure projects in the region (George *et al.,* 2025).

The analysis of international cooperation programmes, strategic initiatives and analytical documents, including "Enhanced Partnership and Cooperation Agreement between the European Union and its Member States, of the one part, and the Republic of Kazakhstan, of the other part" (EPCAs) (2015), Strategy – Global Gateway (n.d.) and The European Green Deal (n.d.), was used to explore opportunities for infrastructure modernisation, renewable energy development and export diversification in Central Asian countries. The method of analysis and generalisation was also applied to analytical materials on green finance and investment risk reduction to determine the role of EU environmental standards in the development of low-carbon logistics corridors, sustainable infrastructure and climate-orientated financing in Central Asia and Eastern Partnership countries (EU4Environment, 2025).

The method of statistical analysis was applied to analytical sources on trade dynamics between Africa and the EU in 2019-2024 based on indicators of exports from Africa to the EU, imports from the EU to Africa, total trade volumes and changes in the trade balance in order to determine changes in foreign trade relations, the level of dependence of African economies on the European market and the potential impact of EU environmental requirements on export-orientated sectors (Ehl & Padros, 2026). The period 2019-2024 was selected due to the availability of statistical data and the possibility of covering the period before the active implementation of the European Green Deal, the post-pandemic recovery of international trade and the strengthening of environmental regulation of the EU. The same method was used to analyse analytical materials on trade dynamics between the EU and the countries of Central Asia in 2020-2024 to determine changes in the structure of trade flows, the role of industrial exports and the development of economic cooperation in the context of strengthening EU environmental standards (Economic Cooperation between…, n.d.; The EU and Central Asia, n.d.). The period 2020-2024 was chosen due to the availability of statistical data for the countries of Central Asia after the COVID-19 pandemic and the possibility of analysing trade dynamics in the context of strengthening the influence of the CBAM and EU environmental standards.

The scenario analysis method was used to study the possible economic consequences of the European Green Deal and CBAM for the countries of Africa and Central Asia under optimistic, baseline and pessimistic scenarios to assess the impact of different levels of production decarbonisation, industrial modernisation, development of renewable energy infrastructure and access to green finance on export competitiveness, foreign direct investment, renewable energy capacity and export losses in the context of strengthening environmental standards of the EU. To build the scenarios, indicators of exports to the EU, dynamics of renewable energy capacity, share of renewables in the national electricity mix, potential Gross Domestic Product (GDP) losses and projected changes in carbon-intensive sectors, in particular metallurgy, aluminium production, cement and fertilisers, which were already mentioned in the study, were used.

Results

EU green transition and external economic effects

The European Green Deal (n.d.) has transformed international economic policy and the global trade regulation system, making environmental and climate requirements a key factor in market access, international competitiveness and investment attractiveness. The EU's policy is increasingly

based on the principles of decarbonisation, circular economy, resource efficiency and low-carbon development. The European Climate Law (Regulation (EU) No. 2021/1119 of the European Parliament and of the Council, 2021) has set the target of achieving climate neutrality by 2050, while reducing emissions by at least 55% by 2030 has become one of the basic benchmarks for the EU's economic transformation. The EU's investment mechanisms play an important role in implementing the green transition, including over EUR 275 billion in clean investments, the Just Transition Fund of almost EUR 20 billion and the expansion of the EU ETS (n.d.), which has already provided over EUR 200 billion in revenues for environmental and social programmes. In these conditions, environmental criteria are integrated into the mechanisms of industrial, trade, investment and financial policies, which contributes to the transformation of global value chains, the development of low-carbon technologies and the change in the structure of international trade. The main initiatives of the European Green Deal and their impact on international economic relations are given in Table 1.

Table 1. Key initiatives of the European Green Deal and their influence on international economic relations

Initiative	Main objective	Key instruments	Influence on international economic relations
Net-Zero Industry Act	Increasing European manufacturing capacity for net-zero technologies and strengthening the competitiveness of the clean technology sector.	Simplified permitting procedures; Single Points of Contact; Net-Zero strategic projects; public procurement and renewable energy auction criteria; Net-Zero Acceleration Valleys; Net-Zero Europe Platform.	Establishes a target for net-zero manufacturing capacity to meet at least 40% of the EU's annual deployment needs by 2030; strengthens investment attractiveness and market access for clean technologies; promotes international net-zero industrial partnerships and restructuring of global supply chains toward low-carbon technologies.
European Critical Raw Materials Act	Ensuring secure, sustainable and diversified supply of critical raw materials for the green and digital transition in the EU.	Development of extraction, processing and recycling capacities; strategic partnerships with third countries; diversification of supply chains; support for research, innovation and recycling; monitoring of supply chain resilience.	Establishes benchmarks by 2030 for 10% domestic extraction, 40% processing and 25% recycling of strategic raw materials in the EU; limits dependence on a single third country supplier to no more than 65%; expands trade and investment cooperation with emerging markets and developing economies through strategic partnerships, WTO cooperation and sustainable investment agreements.
Green Deal Industrial Plan/Clean Industrial Deal	Strengthening EU competitiveness and decarbonisation through support for clean manufacturing, energy transition and circular economy.	Low-carbon procurement requirements; InvestEU support; Innovation Fund; Industrial Decarbonisation Bank; Clean Trade and Investment Partnerships.	Mobilises over EUR 100 billion to support clean manufacturing and industrial decarbonisation; introduces investment conditions for non-EU companies controlling more than 40% of global manufacturing capacity in strategic sectors; strengthens CBAM and promotes diversification of supply chains through Clean Trade and Investment Partnerships.
CBAM	Ensuring a fair carbon price for carbon-intensive goods entering the EU and preventing carbon leakage.	CBAM certificates; embedded emissions reporting; carbon price adjustment based on EU ETS; authorised CBAM declarants; annual emissions declarations.	Applies to cement, iron and steel, aluminium, fertilisers, electricity and hydrogen; covers more than 50% of emissions in ETS-covered sectors after full implementation; requires EU importers exceeding 50 tonnes of CBAM goods to purchase CBAM certificates from 2026; strengthens decarbonisation incentives and aligns international trade with EU climate objectives and WTO rules.
Regulation on Deforestation-free Products (EUDR)	Reducing greenhouse gas emissions and biodiversity loss by ensuring that products consumed in the EU do not contribute to deforestation or forest degradation.	Due diligence requirements; traceability systems; country benchmarking by deforestation risk; EUDR Information System; EU observatory on deforestation and forest degradation.	Covers commodities such as cattle, wood, cocoa, soy, palm oil, coffee, rubber and derived products; aims to reduce carbon emissions linked to EU consumption by at least 32 million tonnes annually; strengthens sustainability requirements and traceability standards in global agricultural and commodity value chains; supported by a EUR 70 million Team Europe Initiative for deforestation-free value chains.
EU Taxonomy for Sustainable Activities	Creating an EU-wide classification system for environmentally sustainable economic activities aligned with net zero objectives by 2050.	Technical screening criteria; Taxonomy Regulation; delegated and implementing acts; sustainable finance disclosure requirements.	Establishes a common definition of sustainable economic activities for financial and non-financial companies; supports scaling up sustainable investments; reduces greenwashing and market fragmentation; redirects international capital flows toward projects aligned with the European Green Deal and EU climate objectives.

Source: compiled by authors based on Regulation on Deforestation-free Products (n.d.), Clean Industrial Deal (n.d.), Carbon Border Adjustment Mechanism (n.d.), EUR-Lex (2023), Regulation (EU) No. 2024/1735 of the European Parliament and of the Council (2024), Regulation (EU) No. 2024/1252 of the European Parliament and of the Council (2024), EU taxonomy for sustainable activities (2026)

The initiatives presented demonstrate the gradual transformation of environmental standards into one of the central mechanisms of international economic regulation. The strengthening of climate, investment and trade

requirements of the EU affects the structure of international trade, global value chains, investment flows and the competitiveness of export-orientated industries. As a result, access to the European market increasingly depends on the ability of countries and companies to adapt production processes, infrastructure and environmental control systems to low-carbon standards and the requirements of sustainable development. The spread of environmental regulation results in the transformation of global value chains. Strengthening climate requirements stimulates international companies to transfer individual stages of production to countries with more developed green infrastructure, access to renewable energy sources and a lower carbon footprint. At the same time, there is a regionalisation of individual segments of global supply chains to reduce logistics costs, reduce emissions and simplify control over compliance with environmental standards. In these conditions, digital monitoring systems, environmental certification, traceability of products and emission control within supply chains become important. At the same time, emission reductions in developed countries are increasingly accompanied by the transfer of carbon-intensive production to Asian countries and other emerging markets. In 2014-2024, CO_2 emissions in the UK decreased by almost 29%, in Germany by 28%, and in the USA by 11%, while in Vietnam they increased by 106%, in Indonesia by 63%, and in India by almost 49%. Even with relatively lower growth rates in China (+23.2%), the absolute increase in emissions was about 2.3 billion tonnes of CO_2, which exceeds the annual emissions of most countries in the world. This indicates the formation of a model of global redistribution of carbon-intensive production, in which some developed economies reduce domestic emissions by transferring industrial capacity to countries with lower environmental requirements and cheaper production resources (Velyka, 2026).

In these conditions, international organisations, in particular the World Trade Organization (2025), the OECD (2025) and the UNCTAD (2025), emphasise the need to coordinate trade, environmental and investment policies. The WTO considers international trade as a tool for the dissemination of low-carbon technologies and environmental innovations but emphasises the importance of the non-discriminatory nature of environmental trade measures. The OECD emphasises the need to coordinate trade and climate policies to support a circular economy, sustainable food systems and the development of green technologies. UNCTAD emphasised the risks of increasing inequality between countries due to different levels of readiness to meet new environmental requirements and the need for financial and technical support for developing countries.

For developing countries, the new environmental requirements of the EU create both additional restrictions and opportunities for economic modernisation. Manufacturers of carbon-intensive products face increasing costs for decarbonisation, certification and adaptation of production to new environmental standards. According to the UNCTAD (2025), the introduction of the CBAM with a price of USD 44 per tonne of embedded CO_2 emissions could reduce developing countries' exports in carbon-intensive sectors by 1.4%, and at prices of USD 88, by 2.4%. Producers of cement, steel, aluminium, fertilisers, chemical products and oil refining will be most affected. According to UNCTAD calculations, at a carbon price of USD 44 per tonne, developed countries' incomes could increase by USD 2.5 billion, while developing countries' incomes could decrease by USD 5.9 billion (UNCTAD, 2021).

An additional challenge is the high concentration of exports of carbon-intensive products in countries whose economies are largely dependent on metallurgy, fertilisers, cement and energy. Among the countries most dependent on CBAM-sensitive sectors are China, Turkey, Ukraine, India and South Korea. In these conditions, export competitiveness increasingly depends not only on production costs but also on the level of carbon intensity of products, access to clean technologies and the ability of enterprises to confirm compliance with international environmental standards. At the same time, companies that are able to adapt to new requirements are given the opportunity to integrate into green global value chains, access to premium segments of the European market and attract green investments. Strengthening environmental requirements stimulates the development of renewable energy, digitalisation of production and the introduction of energy-efficient technologies. At the same time, UNCTAD emphasises that the effect of CBAM for reducing global emissions remains limited, since the mechanism can potentially reduce only about 0.1% of global CO_2 emissions. As a result, mechanisms for green finance, international technical assistance and the dissemination of cleaner production technologies are gaining particular importance to support the adaptation of developing countries to a new low-carbon model of international trade (UNCTAD, 2021).

Thus, the European Green Deal is gradually transforming environmental standards, decarbonisation and climate requirements into one of the key mechanisms of international economic regulation, affecting the structure of world trade, investment flows and global value chains. The introduction of CBAM, strengthening requirements for sustainable production and the development of green financing create both additional barriers for carbon-intensive industries and incentives for technological modernisation and integration into low-carbon supply chains. For developing countries, export competitiveness increasingly depends on the level of carbon intensity of products, access to clean technologies, green investments and the ability to adapt production to international environmental standards. As a result, the effectiveness of adaptation to the new model of international trade will be largely determined by the level of international technical support, the development of green infrastructure, and the coordination of trade, investment, and climate policies.

Impact of the EU green transition on developing countries

The impact of the European Green Deal and CBAM on Central Asian and African countries is manifested through increased competitive pressure on exporters of carbon-intensive products, changes in the conditions of access to the European market and the transformation of the structure of export-orientated sectors. The introduction of CBAM creates additional costs for producers of products with a high level of embedded CO_2 emissions, which gradually changes the structure of international competitiveness in favour of producers with lower carbon intensity, more developed systems of environmental monitoring and more effective Monitoring, Reporting and Verification (MRV) (n.d.) systems. The greatest impact is felt by such carbon-intensive sectors as iron and steel, aluminium, cement, fertilisers, electricity generation, chemicals, the mining industry and energy-intensive manufacturing, whose competitiveness increasingly depends not only on the cost of production but also on the level of decarbonisation, transparency of supply chains and the ability to confirm the environmental characteristics of products (UNECE, 2026).

The most vulnerable country in Central Asia to the impact of CBAM is Kazakhstan, which has the largest volume of industrial exports to the EU and a significant concentration of carbon-intensive industries. The main sectors at risk remain iron and steel, aluminium, cement, fertilisers, electricity and petroleum-linked products. According to World Bank (n.d.) estimates, if CBAM is extended, the share of Kazakhstani exports covered by new environmental requirements may exceed 3% of the country's total exports, while by 2035, iron and steel exports to the EU may decrease by 38% and, under a broader CBAM scenario, by more than 65%. At the same time, the implementation of decarbonisation policies, the development of renewable energy and the introduction of MRV systems can partially reduce the negative impact of new environmental requirements on the country's export competitiveness.

For Azerbaijan, the key risks are primarily related to the reduction in the EU's demand for fossil fuels and the change in the structure of international investment flows. The country's economy is largely dependent on oil and gas exports, and the EU remains one of the main markets for energy resources. In the baseline scenario of the impact of the European Green Deal, Azerbaijan's oil-related exports could decrease by approximately USD 2.5 billion by 2035 (World Bank, 2022). For Turkmenistan, the main risks are related to fertilisers, energy-related exports and low levels of economic diversification, while for Uzbekistan, Kyrgyzstan and Tajikistan, the impact is mainly sector-specific and concerns aluminium production, electricity-intensive industries and industrial goods with a high level of energy intensity. A common feature for most Central Asian countries remains the high dependence of industry and energy on fossil-fuel-based power generation, which increases the carbon intensity of export-orientated sectors.

At the same time, the deepening of cooperation between the EU and the countries of Central Asia through the Enhanced Partnership and Cooperation Agreement between the EU and its Member States, of the one part, and the Republic of Kazakhstan, of the other part (2015), the strategy – "Global Gateway" (n.d.) and the European Green Deal (n.d.) creates opportunities for the modernisation of infrastructure systems, the development of green technologies and the diversification of exports. The development of transport corridors, renewable energy infrastructure, digital trade systems and sustainable industrial projects is gradually becoming one of the key areas of economic cooperation between the EU and the region. In these conditions, the competitiveness of the countries of Central Asia increasingly depends on the ability to adapt industrial production, logistics systems and export-orientated sectors to low-carbon standards of international trade. Similar transformation processes are observed in African countries, for which the European Green Deal and CBAM create both risks for carbon-intensive export sectors and incentives for the modernisation of production and the development of low-carbon technologies. Africa remains one of the EU's key trading partners: in 2019, Africa-EU trade reached approximately EUR 280 billion, while the EU absorbed about 28% of Africa's total exports. At the same time, the structure of African exports remains largely raw material and carbon-intensive, as a significant share of supplies to the EU falls on crude oil, gas, metals, minerals, fertilisers and other primary commodities. According to estimates by the African Climate Foundation & London School of Economics and Political Science (2023), CBAM could reduce African exports to the EU of aluminium by up to 13.9%, iron and steel by 8.2%, fertiliser by 3.9% and cement by 3.1%, while in some scenarios, the African continent's GDP could decrease by approximately 0.91%, equivalent to about USD 25 billion.

Least developed countries (LDCs), a significant part of which are located in Africa, are particularly vulnerable. Africa covers 33 of the 46 global least developed countries, and if CBAM were extended to a wider range of products, individual countries could lose more than 1.5% of GDP, while in some scenarios the losses could reach 8.4%. An additional risk factor is the insufficient development of carbon monitoring systems and carbon markets in most African countries, which increases the likelihood of applying higher default emissions values and increasing the actual CBAM burden for exporters. The mining industry, agriculture, cement production and energy sectors remain the most sensitive sectors, which form a significant part of employment and export revenues in many African economies. A high level of vulnerability is observed in agriculture, where new requirements for traceability, sustainable production and deforestation-free supply chains for cocoa, coffee, palm oil, soy, rubber, cattle and wood products increase costs for smallholders, exporters and agricultural producers

(African Climate Foundation & London School of Economics and Political Science, 2023).

At the same time, the green transition stimulates the development of renewable energy, green infrastructure, climate finance and clean technologies in Africa. The significant potential of solar, wind and hydropower resources creates the prerequisites for the development of renewable energy projects and attracting green investments. The volume of climate finance for African countries increased from USD 29.5 billion in 2019-2020 to USD 43.7 billion in 2021-2022. Green bonds, blended finance, public-private partnerships and international investment programmes are increasingly used to modernise renewable energy, transport infrastructure, water systems and cleaner industrial production. As a result, the modernisation of industrial production is increasingly taking place through the introduction of cleaner machinery, energy-efficient technologies, digital monitoring systems and climate-related standards, while the employment structure is gradually shifting from traditional carbon-intensive sectors to renewable energy, sustainable agriculture, emissions monitoring, digital traceability systems and green industrial services (Freitas & Mwaniki, 2024).

Under the influence of the EU's environmental requirements, the structure of international investment in African and Central Asian countries is gradually shifting from carbon-intensive industries to renewable energy, low-carbon manufacturing and sustainable infrastructure projects. As a result, international investors are increasingly focusing on projects that involve the integration of renewable energy, energy-efficiency modernisation, emissions monitoring systems and compliance with EU-aligned environmental standards. For African economies, these processes are having a heterogeneous impact on export-orientated sectors. Countries exporting steel, aluminium, fertilisers and minerals to the EU are facing increasing carbon trade risks. At the same time, the EU's climate finance mechanisms, including the Global Gateway initiatives and the Green Industry Partnership, are stimulating the development of renewable energy, green hydrogen and low-carbon production. Africa is gradually strengthening its position in the field of green industrialisation through investments in renewable energy, sustainable manufacturing and green infrastructure. The industrial sector in Africa is expected to grow by around 20% annually, and its share in GDP could increase from 13% to 32% by the end of 2025. South Africa, Egypt and Morocco show the greatest potential for attracting investment in renewable energy through the development of solar and wind power, as well as green hydrogen projects. Morocco is integrating green hydrogen production into industrial zones; Egypt is developing environmentally friendly cement production and renewable infrastructure; and South Africa is modernising the mining, automotive and chemical sectors using renewable power. Kenya and Ethiopia are strengthening their positions through the development of geothermal energy and low-carbon industrial parks. Namibia is developing solar-powered refining plants and green hydrogen projects for the EU market. Mauritius and Tunisia are focusing on low-carbon manufacturing, sustainable textile production, green steel manufacturing and circular economy practices within export-orientated industries (Ebatamehi, 2025).

In Central Asian countries, the EU's environmental requirements most affect metallurgy, ferroalloys, aluminium, chemical products and other energy-intensive industries. According to the Asian Development Bank, the most vulnerable to the CBAM in the region are aluminium production in Kazakhstan and the fertiliser sector in Georgia. For Kazakhstan, about 42.15% of aluminium exports are aimed at the EU market, making the country one of the most dependent on carbon trade restrictions in Central Asia. As a result, the investment attractiveness of enterprises is increasingly determined by the ability to integrate renewable energy sources, emission monitoring systems and environmentally friendly production technologies. The expected level of carbon border tax for basic metallurgy could reach 68.16% of exports to the EU for South Africa, 38.8% for India and 22.05% for Vietnam (Park *et al.,* 2023). This indicates an increase in investment risks for industries that do not carry out technological modernisation or do not implement emission reduction technologies. As a result, the structure of foreign direct investment is gradually changing: carbon-intensive industries are becoming less attractive for traditional investments in production capacity, while investors are increasingly focused on modernisation of industrial enterprises, the integration of renewable energy and increasing the carbon efficiency of production.

Green financing and investment risk reduction mechanisms are increasingly being used in Central Asia and the Eastern Partnership countries. The OECD notes that green investments in these countries face political, financial and geopolitical risks, including high capital costs, exchange rate volatility and underdeveloped financial markets. To reduce risks, concessional loans, guarantees, blended finance mechanisms, currency hedging and technical assistance programmes are used. Through green credit lines, international financial institutions have channelled more than EUR 3 billion to the region over the past twenty years. The EU's environmental standards are also influencing the modernisation of industrial production and logistics infrastructure in Central Asia. European transport and infrastructure initiatives are stimulating the development of low-carbon logistics corridors, electrified railway systems, multimodal transport hubs and environmentally friendly production technologies. As a result, compliance with the EU's environmental standards is gradually becoming not only a trade requirement but also a necessary condition for access to European investment programmes and climate-orientated financing (EU4Environment, 2025). The main directions of transformation of export-orientated sectors and the investment environment in the countries of Africa and Central Asia are given in Table 2.

Table 2. Impact of EU green transition on export-oriented sectors and investment environment in Africa and Central Asia

Region/ Country	Main carbon-intensive sectors	Main EU environmental risks	Investment transformation	Main adaptation directions
Kazakhstan	Iron and steel, aluminum, fertilizers, electricity	CBAM exposure, high carbon intensity, dependence on EU exports	Shift from brownfield FDI to green modernisation	Renewable energy, MRV systems, cleaner production
Azerbaijan	Oil and gas, petrochemicals	Declining EU fossil fuel demand	Diversification of investment flows	Green energy corridors, renewable infrastructure
Uzbekistan	Aluminum, electricity-intensive industries	Carbon-related trade risks	Sector-specific green investments	Energy efficiency, industrial modernisation
African LDCs	Agriculture, mining, cement	Traceability requirements, CBAM, EUDR	Increased role of climate finance	Sustainable agriculture, emissions monitoring
South Africa	Mining, metals, automotive	High CBAM exposure in metallurgy	Growth of renewable-linked industrial investments	Green hydrogen, renewable-powered industry
Morocco/ Egypt	Cement, manufacturing, energy	Sustainability and ESG requirements	Expansion of green industrial clusters	Solar/wind projects, low-carbon manufacturing

Source: compiled by authors based on World Bank (2022, n.d.), African Climate Foundation & London School of Economics and Political Science (2023), S. Ebatamehi (2025), European Commision (n.d.)

The data presented show that the impact of the EU's environmental requirements is differentiated depending on the structure of exports, the level of carbon intensity of production and the degree of integration of countries into international value chains. Carbon-intensive industries, in particular metallurgy, the fertiliser industry, cement production and energy, are most affected. At the same time, the development of renewable energy, green financing and low-carbon industrial modernisation creates the prerequisites for the structural transformation of the economy and attracting new investments. Thus, the European Green Deal, CBAM and broader environmental standards of the EU are shaping the long-term transformation of investment mechanisms in the countries of Africa and Central Asia. Industries dependent on fossil fuels and carbon-intensive production are gradually losing their investment attractiveness without modernisation and decarbonisation, while renewable energy, low-carbon production, green industrial clusters and sustainable infrastructure are becoming priority areas of international investment flows.

Economic effects of the EU green transition on developing countries

The dynamics of trade between Africa and the EU indicate a gradual strengthening of economic interaction and the growing role of the European market for African exporters. After a reduction in trade figures in 2020 due to the COVID-19 pandemic, mutual trade volumes began to recover rapidly, which was accompanied by an increase in exports of raw materials and energy-intensive products to the EU (Fig. 1).

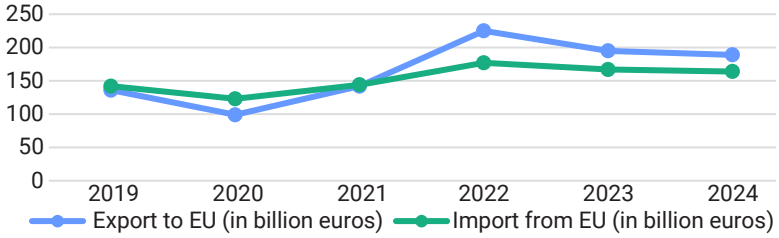

Figure 1. Dynamics of trade between Africa and the EU in 2019-2024

Source: compiled by authors based on D. Ehl & A.M. Padros (2026)

The dynamics of trade between Africa and the EU indicate the growing importance of the European market for African exporters. According to Eurostat, exports from Africa to the EU increased from EUR 136 billion in 2019 to EUR 189 billion in 2024. Exports dropped to EUR 99 billion in 2020 as a result of the COVID-19 pandemic, but they rebounded rapidly and reached a high of EUR 225 billion in 2022. At the same time, imports from the EU to Africa increased from EUR 142 billion in 2019 to EUR 164 billion in 2024. A significant part of African exports to the EU are oil, gas, metals and other raw materials, which increases the sensitivity of export-orientated sectors to EU environmental standards and the CBAM. Similar trends are observed in the countries of Central Asia, where, after a reduction in trade indicators during the COVID-19 pandemic, there was a gradual increase in mutual trade volumes with the EU (Fig. 2).

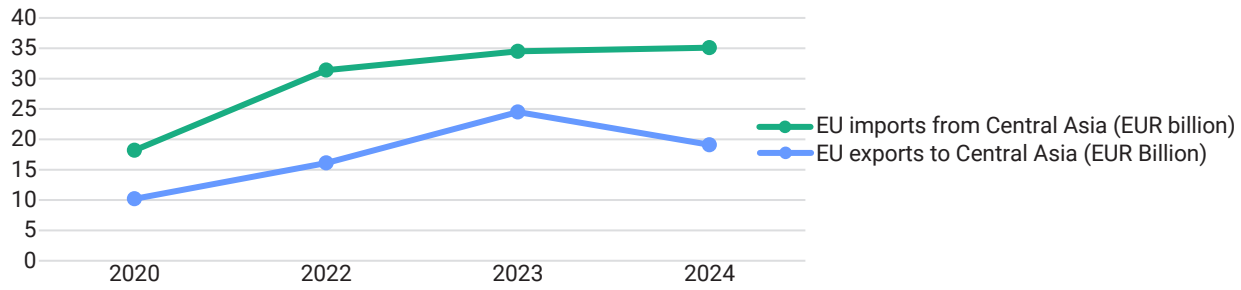

Figure 2. Dynamics of trade between the EU and Central Asia in 2020-2024
Source: compiled by authors based on Eurasian Research Institute (n.d.), European Commision (n.d), The EU and Central Asia (n.d.), EU-Central Asia trade (n.d.)

Trade and economic cooperation between the EU and the countries of Central Asia is characterised by a gradual increase in trade and investment interaction. In 2020, the volume of exports from Central Asian countries to the EU decreased to USD 18.2 billion, which was the lowest figure in the last decade. At the same time, exports from the EU to the countries of Central Asia during this period amounted to USD 10.2 billion. In 2022, imports from the EU to the countries of Central Asia amounted to EUR 31.4 billion, while exports from the EU to the region reached EUR 16.1 billion. As a result, the trade balance for the EU remained negative at around EUR -15.3 billion, which indicates the predominance of raw material exports from the countries of Central Asia to the European market. In 2023, the share of trade with the EU was 22.6% of the total foreign trade of the Central Asian countries, and the total volume of trade in goods and services between the parties exceeded EUR 59 billion. In particular, the EU's imports from Central Asia amounted to EUR 32.5 billion in goods and about EUR 2 billion in services, while the EU's exports to Central Asia reached EUR 20.2 billion in goods and EUR 4.3 billion in services. In 2024, the EU's imports from Central Asia reached approximately EUR 35.1 billion, while the EU's exports to the region amounted to approximately EUR 19.1 billion, resulting in a negative trade balance for the EU of approximately EUR -16 billion.

The assessment of investment and infrastructure development dynamics in Africa and Central Asia shows that the impact of the EU's green transition is gradually going beyond trade regulation and increasingly affecting the structure of investment, the modernisation of production and the development of low-carbon infrastructure. In recent years, developing countries have witnessed a gradual increase in investment in renewable energy, green industrial projects and energy-efficient infrastructure. These processes are most noticeable in countries with high dependence on exports to the EU and significant vulnerability to CBAM-sensitive sectors.

In Africa, the transformation of investment flows is primarily associated with the development of renewable energy infrastructure and low-carbon industrial projects. South Africa remains one of the regional leaders in renewable energy, with installed renewable energy capacity exceeding 10 GW and an estimated 1.6 GW of new capacity added by 2025 (Jowett, 2026). Morocco has become one of the largest solar power hubs in Africa with the NOORo I CSP IPP (n.d.) complex, which provides electricity to over 1 million households and supports the development of low-carbon industrial infrastructure. Egypt is actively developing renewable energy and green hydrogen projects, while Kenya and Ethiopia are strengthening their positions through the development of geothermal energy and low-carbon industrial parks. In 2024, Africa's installed renewable energy capacity reached 67 GW, up 4.2 GW or 6.7% year-on-year. The main growth was driven by Egypt, Ethiopia and South Africa, reflecting the region's growing role in developing low-carbon energy infrastructure (International Renewable Energy Agency, 2025). The impact of the EU's environmental standards on investment dynamics is increasingly evident in Central Asian countries. Kazakhstan has demonstrated the highest level of renewable energy modernisation. In 2024, the country had 148 renewable energy facilities with a total capacity of about 2.9 GW, including solar, wind and small hydropower plants. In 2025, the number of renewable facilities increased to 162, while the share of renewables in the national electricity mix reached about 7%. One of the largest infrastructure projects in the region is the Mirny (TotalEnergies, n.d.) wind farm in Kazakhstan, which envisages the creation of about 1 GW of wind capacity and a battery storage system with a capacity of 600 MWh with a total investment of approximately USD 1.2 billion (Hernandez & Rabiega, 2026). Infrastructure modernisation in the region is also associated with the implementation of large hydropower projects, in particular the Kambarata-1 Hydropower Project (n.d.) in Kyrgyzstan with a capacity of 1,860 MW supported by international financial institutions (George *et al.,* 2025). The observed investment dynamics indicate a gradual transformation of the business environment in developing countries under the influence of the EU's green transition. Investment flows are increasingly concentrated in renewable energy, energy-efficient modernisation of industry, low-carbon manufacturing and sustainable transport infrastructure, while carbon-intensive sectors with a low level of decarbonisation face increasing investment constraints. In these conditions, the competitiveness of export-orientated industries

increasingly depends on the ability to integrate renewable energy technologies, emissions monitoring systems, sustainable logistics infrastructure, and environmental reporting standards into production processes and international supply chains.

The scenario analysis showed that the economic impacts of the European Green Deal and CBAM for African and Central Asian countries depend to a large extent on the level of decarbonisation of production, the pace of industrial modernisation and access to green finance. The calculations were based on export figures to the EU in 2024, the dynamics of renewable energy capacity, the share of renewable energy in the national electricity balance and the projected changes in carbon-intensive sectors already analysed in the study. The baseline for Africa was EUR 189 billion in exports to the EU in 2024, and for Central Asia, the EU's imports from the region were EUR 35.1 billion. The optimistic scenario assumed active decarbonisation, the development of renewable energy, cleaner production technologies and the implementation of monitoring, reporting and verification (MRV) systems. The baseline scenario reflected partial adaptation to the EU's environmental standards, while the pessimistic scenario assumed slower industrial modernisation, limited access to green finance, and a broader expansion of CBAM requirements. In the optimistic scenario, the decline in developing countries' exports to the EU remains at around 1.4%. For Africa, this corresponds to potential export losses of around EUR 2.65 billion compared to exports to the EU of EUR 189 billion in 2024, while for Central Asia, the losses could amount to around EUR 0.49 billion compared to exports of EUR 35.1 billion. At the same time, this scenario maintains the positive dynamics of green investment and renewable energy infrastructure. Assuming an annual growth rate of renewable energy capacity in Africa of 6.7%, installed capacity could grow from 67 GW in 2024 to around 96-99 GW by 2030. For Kazakhstan, the implementation of the 1 GW Mirny project could increase the country's renewable energy capacity from around 2.9 GW to almost 4 GW, and the share of renewable energy sources in the national electricity balance could potentially increase from 7% to around 10-12%.

The baseline scenario assumes partial adaptation of export-orientated sectors to new environmental requirements while maintaining significant dependence on carbon-intensive industries. In this scenario, the reduction in exports could reach around 2.4%. For Africa, this is equivalent to a potential loss of around EUR 4.54 billion in exports to the EU and for Central Asia, around EUR 0.84 billion. In this case, the metallurgy, aluminium, cement and fertiliser production will be most negatively affected. In particular, for Kazakhstan, exports of iron and steel to the EU could potentially decline by about 38% by 2035, while for Africa, exports of aluminium could decline by 13.9%, iron and steel by 8.2%, and fertiliser by 3.9%. At the same time, the growth rate of renewable energy infrastructure remains moderate: installed renewable energy capacity in Africa in this scenario could grow to about 85-88 GW by 2030 and the share of renewables in Kazakhstan's electricity mix to about 8-9%.

The pessimistic scenario assumes a large-scale extension of CBAM and other environmental standards to a wider range of goods while industrial modernisation slows down and decarbonisation rates remain low. Under these conditions, the potential reduction in exports could exceed 4%. For Africa, this corresponds to a loss of over EUR 7.5 billion in exports to the EU and, for Central Asia, over EUR 1.4 billion. For some African least developed countries, GDP losses may exceed 1.5% and, in some scenarios, reach 8.4%. In this case, a significant part of foreign direct investment is gradually reoriented from carbon-intensive industries to low-carbon manufacturing and renewable energy projects in other regions. In the pessimistic scenario, the pace of development of renewable energy infrastructure remains insufficient to compensate for trade losses: renewable energy capacity in Africa by 2030 may grow only to about 75-78 GW, while the share of renewables in Kazakhstan's electricity mix will remain around 7-8%. The results obtained indicate that the scale of economic losses for developing countries will largely depend on the speed of technological modernisation, the development of renewable energy, access to climate finance and the ability of enterprises to adapt to the environmental standards of the EU.

Thus, the European Green Deal is gradually transforming the business environment in the countries of Africa and Central Asia, creating new conditions for international competitiveness, investment activity and the development of export-orientated production. Integration into low-carbon global value chains increasingly depends on the development of renewable energy, industrial modernisation, sustainable infrastructure and the ability of enterprises to adapt to the environmental standards of the EU.

Discussion

The EU's green transition is accompanied by a large-scale transformation of the economic, investment and trade system, which changes the conditions for the functioning of international markets, the structure of employment and global supply chains. In the study by S. Reither *et al.* (2025), the EU's green transition was considered primarily as a result of the strengthening of the role of state regulation, climate policy and financial mechanisms in the transformation of the economy. An analysis of 57 Commission Communications for 2009-2023 showed a gradual transition of the EU to more active state intervention in the processes of decarbonisation and industrial modernisation. A similar logic was traced in this study through the analysis of CBAM, the European Climate Law and the Net-Zero Industry Act. At the same time, the emphases of the studies differed. While S. Reither *et al.* focused mainly on the internal evolution of the EU's economic policy, this study focused mainly on the external consequences of the green transition for the countries of Central Asia and Africa. In particular, the risks of a 1.4-2.4% reduction in developing

countries' exports were analysed, as well as a possible 13.9% reduction in aluminium exports from Africa to the EU.

The topic of employment and economic restructuring became common for the study by E. Cappa *et al.* (2024). The authors proved that one megawatt of renewable energy capacity created about 40 jobs over seven years, mainly in construction and agriculture. In this study, the development of renewable energy infrastructure and green industrial projects was also considered as a factor in the modernisation of production and the transformation of the employment structure. However, E. Cappa *et al.* analysed the internal regional effects of investments in renewable energy in European countries, while this study focused on the impact of the European Green Deal and CBAM on exports, investments and competitiveness of African and Central Asian countries.

A similar division between internal and external effects of the green transition was observed when comparing it with the work of N. Chatzistamoulou & P. Koundouri (2024). The authors analysed the EU-28 countries in 2010-2019 and focused on the relationship between eco-innovation, renewable energy, green taxation and environmental efficiency. Their study focused on the internal macroeconomic transformation of the EU, resource efficiency and the circular economy. This work similarly considered decarbonisation mechanisms, the development of clean technologies and regulatory instruments, but the main focus shifted to the external economic consequences of EU environmental policy for developing countries.

The debated nature of the green transition was particularly evident in the work of D. Villani *et al.* (2025), who questioned traditional approaches to measuring green jobs and concluded that 24 European countries experienced almost no net growth in green employment during 2011-2022. In contrast, this study considered renewable energy projects, green finance and industrial modernisation as drivers of new employment opportunities. Similar labour market transformations were analysed by A. Javed & N. Usman (2025), who found that stricter environmental policies and the transition to renewable energy increased demand for high-skilled labour while reducing demand for low-skilled workers in Italy's traditional energy sectors. However, their focus remained on internal labour market changes, whereas this study examined the impact of the European Green Deal on export competitiveness and investment processes in African and Central Asian countries.

The infrastructural and geopolitical dimensions of the green transition were more clearly reflected in the works of S. Tagliapietra (2024). In his 2024 study, Global Gateway was presented as a tool for developing sustainable infrastructure, renewable energy and EU cooperation with partner countries, particularly in Africa. Similar trends were identified in this study through the analysis of renewable energy infrastructure, sustainable transport corridors and green industrial projects in Africa and Central Asia. At the same time, S. Tagliapietra focused more on geopolitical competition between the EU and the Belt and Road Initiative, while this study concentrated on the trade and investment effects of CBAM and decarbonisation.

In later research, S. Tagliapietra *et al.* (2025) examined electric vehicles, battery supply chains and the EU's dependence on Chinese investments and critical raw materials. Likewise, this study considered stricter environmental standards and CBAM as factors increasing risks for carbon-intensive sectors and raw-material-exporting economies. However, S. Tagliapietra *et al.* focused mainly on EU industrial policy and strategic autonomy, whereas this study analysed the adaptation of business environments in developing countries to new low-carbon standards. The role of green finance in economic transformation was explored by B. Fu *et al.* (2025) and W. Xu *et al.* (2025). Their studies showed that green finance policies in China stimulated employment growth, accelerated energy transition and supported cleaner technologies. Similarly, this study emphasised the importance of green investments, cleaner production technologies and digital monitoring systems for industrial modernisation and supply chain adaptation. Nevertheless, the Chinese studies focused on domestic policy mechanisms, while this research analysed the external economic effects of EU climate regulation on Africa and Central Asia.

Comparable conclusions were presented by X. Li & M. Du (2025), who analysed China's green industrial policy through the lens of international trade law and WTO norms. Both studies recognised that decarbonisation and clean technologies were reshaping global supply chains and trade relations. However, X. Li & M. Du focused on state support for electric vehicle and solar technology producers in China, whereas this study examined the external implications of the European Green Deal, CBAM and EUDR for developing countries. A similar distinction appeared in A. Khalique *et al.* (2025), who examined environmental regulation and climate investment within the EU-22. In contrast, this study focused on the emergence of new trade barriers for developing countries and the risks of carbon leakage to less regulated markets.

The social dimension of the green transition was addressed in the works of A. Hassel & K. Weil (2023) and Z.J. Im *et al.* (2025). A. Hassel & K. Weil analysed the role of social partners, trade unions and employers in ensuring a just transition for European workers, while Z.J. Im *et al.* compared social and industrial responses to decarbonisation in Denmark, Germany, Spain and Poland. These studies coincided with this work in that the green transition was interpreted as a process that changed the structure of employment, created additional costs for business and required compensation mechanisms. At the same time, the main focus of these authors was on the internal models of social protection, collective bargaining and industrial policy in the EU. This study examined socio-economic risks more broadly, through the impact of CBAM, EUDR, and other EU standards on employment, investment, and export opportunities in African and Central Asian countries, where institutional resources for adaptation were much

more limited. The closest foreign-economic perspective was presented by I. Valiyeva & K. Garashli (2025), who analysed the impact of environmental policies, CBAM and certification requirements on global trade and supply chains. Both studies emphasised the risks of uneven distribution of environmental burdens and the relocation of carbon-intensive industries to less regulated markets. However, I. Valiyeva & K. Garashli considered these processes globally, while this study focused specifically on the consequences of EU regulation for Africa and Central Asia.

A similar issue was raised by F.M. Hoffart & F. Holz (2024), who examined the risks of energy asset stranding in resource-dependent countries caused by declining demand for fossil fuels. While their study focused on losses related to oil, gas and coal assets, this work analysed the external pressure of EU regulatory instruments such as CBAM and EUDR on trade, production and investment in developing economies. The political and distributional dimensions of the green transition were explored by S. Baute (2025) and D. Plehwe *et al.* (2025). S. Baute showed that support for climate reforms depended on perceptions of fairness and the "polluter pays" principle, whereas this study focused on unequal effects between the EU and developing countries. D. Plehwe *et al.* highlighted political resistance to renewable energy and green jobs from fossil-fuel-related networks, while this study emphasised the economic consequences of EU regulation, including new trade barriers, rising adaptation costs and risks of carbon leakage to less regulated regions.

The analysis showed that modern studies of the green transition mainly focus on the decarbonisation of the economy, the development of renewable energy, green finance, labour market transformation and changes in international trade. Most of the work confirmed that environmental regulation and climate investments stimulate the modernisation of production and the development of low-carbon technologies. At the same time, it was found that the strengthening of EU environmental standards and the implementation of CBAM and EUDR create new risks for export competitiveness, investment climate and employment in African and Central Asian countries. There was also a trend towards the transfer of carbon-intensive production to less regulated regions, indicating the uneven global impact of the green transition.

Conclusions

The study found that CBAM, EUDR and other environmental mechanisms of the EU are transforming the international economic environment, affecting trade, investment and the competitiveness of developing countries. The competitiveness of export-orientated sectors increasingly depends on carbon intensity, environmental monitoring systems and cleaner production technologies. In 2014-2024, CO_2 emissions in the UK decreased by almost 29% and in Germany by 28%, while in Vietnam they increased by 106%, in Indonesia by 63% and in India by almost 49%, indicating the transfer of carbon-intensive production to emerging markets. The greatest impact of CBAM concerns metallurgy, aluminium, cement, fertilisers and other energy-intensive industries. The mechanism at a carbon price of USD 44 per tonne of embedded CO_2 emissions could reduce developing countries' exports by 1.4%, while at USD 88 the reduction could reach 2.4%.

Scenario analysis showed that the economic consequences for African and Central Asian countries depend on the level of decarbonisation and industrial modernisation. Under the optimistic scenario, Africa's exports to the EU could decrease by about EUR 2.65 billion, while Central Asia's exports could decline by about EUR 0.49 billion. If renewable energy capacity in Africa continues to grow by 6.7% annually, installed capacity could increase from 67 GW in 2024 to 96-99 GW by 2030. In Kazakhstan, the 1 GW Mirny project could increase renewable energy capacity to almost 4 GW and raise the share of renewables in the electricity mix to 10-12%.

The baseline scenario assumes export losses of around EUR 4.54 billion for Africa and EUR 0.84 billion for Central Asia. Kazakhstan's iron and steel exports to the EU could decrease by about 38% by 2035, while African aluminium exports could decline by 13.9%, iron and steel by 8.2% and fertiliser by 3.9%. The pessimistic scenario assumes export reductions exceeding 4%, corresponding to losses of more than EUR 7.5 billion for Africa and EUR 1.4 billion for Central Asia. For some African least-developed countries, GDP losses could exceed 1.5% and reach 8.4%. At the same time, the green transition stimulates renewable energy and low-carbon manufacturing. Climate finance for Africa increased from USD 29.5 billion in 2019-2020 to USD 43.7 billion in 2021-2022. In South Africa, about 1.6 GW of new renewable capacity was commissioned in 2025, while in Kazakhstan the number of renewable energy facilities increased to 162. A limitation of this study is its focus mainly on macroeconomic and foreign trade effects without detailed analysis of individual enterprises and local production chains. Further research should focus on econometric analysis of the impact of CBAM, climate finance and renewable energy investments on export competitiveness and decarbonisation in developing countries.

Acknowledgements

None.

Funding

None.

Conflict of Interest

None.

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Бізнес-середовище для робочих місць, інвестицій та експорту: реальний вплив зелених переходів ЄС на країни, що розвиваються

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Анотація. Метою цього дослідження було оцінити вплив екологічної трансформації ЄС на економічний розвиток країн, що розвиваються, в контексті зайнятості, інвестиційної активності та зовнішньої торгівлі. Методологія дослідження базувалася на порівняльному, статистичному та сценарному аналізі, а також методах аналізу та узагальнення. Результати показали, що викиди вуглекислого газу у Великій Британії зменшилися майже на 29 %, у Німеччині – на 28 %, тоді як у В'єтнамі вони зросли на 106 %, в Індонезії – на 63 % та в Індії – майже на 49 %, що свідчить про переміщення вуглецемісткого виробництва до ринків, що розвиваються. Експорт з Африки до ЄС зріс зі 136 млрд євро у 2019 році до 189 млрд євро у 2024 році, тоді як імпорт з Центральної Азії досяг 35,1 млрд євро. Сценарний аналіз показав, що втрати від експорту можуть перевищити 7,5 млрд євро для Африки та 1,4 млрд євро для Центральної Азії за песимістичним сценарієм. Потужність відновлюваної енергетики в Африці може досягти 96-99 гігават до 2030 року, тоді як у Казахстані вона може зрости майже до 4 гігават. Дослідження показало, що Європейська зелена угода збільшила торговельні ризики для вуглецевомістких секторів, одночасно стимулюючи розвиток відновлюваної енергетики та низьковуглецеву модернізацію промисловості. Практичне значення дослідження полягає в можливості використання результатів органами державної влади, експортерами, промисловими підприємствами та інвесторами для оцінки ризиків Механізму вуглецевого коригування на кордоні та планування низьковуглецевої модернізації промисловості

Ключові слова: механізм вуглецевого коригування на кордонах; прямі іноземні інвестиції; декарбонізація; індустріалізація; кліматична політика; глобальні ланцюги створення вартості