

Green Finance And Its Role in Developing Countries

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Received: 24 June 2026; **Accepted:** 20 July 2026; **Published:** 11 August 2026

Abstract: This article examines the theoretical foundations of green finance and its role in promoting sustainable economic and environmental development in developing countries. The study analyzes the contribution of green financial instruments, including green bonds, green loans, ESG investments, and climate funds, to economic growth, renewable energy development, and the reduction of carbon dioxide emissions. Furthermore, the research identifies the major challenges hindering the expansion of green finance in developing countries, such as limited financial resources, underdeveloped capital markets, institutional constraints, and regulatory barriers. Based on the findings, practical recommendations are proposed to enhance the effectiveness of green finance mechanisms and increase investment in environmentally sustainable projects. The results indicate that green finance plays a significant role in accelerating the transition to a green economy, strengthening environmental sustainability, improving investment attractiveness, and supporting long-term economic growth. The findings of this study can serve as a scientific basis for policymakers, financial institutions, and investors in designing and implementing green finance strategies, particularly in developing countries, including Uzbekistan.

Keywords: Green finance, sustainable development, green economy, developing countries, green investment, green bonds, ESG, climate change, renewable energy, environmental sustainability, carbon emissions, economic growth.

Introduction: Climate change, the depletion of natural resources, the loss of biodiversity, and the increase in environmental pollution have become some of the most pressing challenges facing the global economy in the 21st century. These environmental threats are having a significant impact not only on the natural environment, but also on the economic stability, social well-being, and long-term development prospects of countries. For this reason, many countries around the world are aiming to transition to a new development model aimed at harmonizing economic growth with the principles of environmental sustainability. As the financial basis of this model, green financing mechanisms are gaining particular importance. Green financing is a system of financing investments that ensure environmental sustainability, reduce the negative consequences of climate change, and rationally use natural resources. Through this system, projects aimed at developing renewable energy sources, increasing energy efficiency, creating

ecological transport infrastructure, recycling waste, managing water resources, and reducing carbon emissions will be financially supported. As a result, green financing will help ensure a balance between economic growth and environmental security.

In recent years, the volume of investments directed towards the green economy by international financial institutions, governments and private investors has increased significantly. This has been driven by the Paris Climate Agreement adopted in 2015, the UN Sustainable Development Goals by 2030, and the strategies of many countries to achieve carbon neutrality. Within these initiatives, green bonds, sustainable loans, ESG investments, climate funds and other innovative financial instruments are rapidly developing. This has made green finance one of the priorities of global economic policy. The importance of green finance is considered even higher in developing countries. These countries must address complex challenges such as addressing environmental issues,

modernizing their energy systems, developing infrastructure, and adapting to climate change while achieving economic growth. However, limited financial resources, underdeveloped capital markets, institutional challenges, and high investment risks limit their ability to finance green projects. For this reason, expanding the participation of international financial institutions, development banks, and the private sector is an important strategic task for these countries.

The green finance market has been expanding in developing countries over the past decade. In particular, China, India, Brazil, Indonesia, South Africa, and Central Asian countries are seeing increasing investment in renewable energy, green transport, and energy efficiency projects. Such investments serve to create new jobs, promote technological innovation, strengthen energy security, and ensure environmental sustainability. At the same time, institutional reforms, improving the regulatory framework, and enhancing transparency in financial markets are necessary to increase the economic efficiency of green financing.

In Uzbekistan, the transition to a green economy has also been identified as one of the priorities of state policy. The country is implementing a number of strategic programs to widely introduce renewable energy sources, increase energy efficiency, attract "green" investments, and finance environmentally sustainable projects. At the same time, expanding cooperation with international financial institutions, developing the green bond market, and improving green financing mechanisms by encouraging private investors remain urgent tasks.

The purpose of this study is to scientifically assess the role of green finance in ensuring economic development and environmental sustainability in developing countries, as well as to identify existing problems and promising development directions in this area. The concept of green finance has been widely used in recent years as one of the important financial instruments for sustainable development and combating climate change. This concept includes financing of investments that contribute to the formation of an environmentally sustainable economy, promoting the rational use of natural resources, and financial mechanisms aimed at reducing carbon emissions. Today, green finance is considered an integral part not only of environmental policy, but also of macroeconomic development strategies.

In the scientific literature, the concept of green finance is interpreted based on different approaches. Some researchers interpret it as a system of investments aimed at reducing environmental risks, while others evaluate green finance as a financial mechanism that

combines economic growth with environmental sustainability. The common feature of these approaches is that they recognize the need to ensure a balance between economic development and environmental protection.

In international practice, the theoretical foundations of green finance are closely linked to the principles of ecological economics, sustainable development, and ESG (Environmental, Social and Governance). The ESG approach emphasizes the need for investors to consider environmental and social factors along with financial performance when making investment decisions. As a result, enterprises and financial institutions are striving to increase environmental responsibility. Reports published by international organizations have noted the growing importance of green finance in the global economy. In particular, the steady growth in the volume of green bonds, sustainable loans, climate funds, and ESG investments indicates growing confidence in this financial direction. At the same time, renewable energy, energy efficiency, green transport and waste recycling projects are recognized as the most financed areas.

Scientific research confirms that green financing has a positive impact on economic growth in developing countries. Such investments strengthen the economic potential of countries by creating new production capacities, introducing modern technologies, increasing energy efficiency, and creating new jobs. In addition, green finance expands opportunities for reducing environmental risks, efficiently using natural resources, and adapting to climate change.

At the same time, the scientific literature has also extensively analyzed the factors that hinder the widespread implementation of green finance in developing countries. These include insufficiently developed financial markets, limited long-term financial resources, institutional problems, an imperfect regulatory framework, and a high level of risk for investors. These factors are preventing green investment from growing at the expected pace in many countries.

Studies in Central Asian countries also highlight the importance of developing green finance. Despite the high potential for renewable energy in the region, the share of green investment remains relatively low. The main reasons for this are the slow pace of institutional reforms, the lack of sufficient financial instruments, and limited private sector participation.

Scientific research on Uzbekistan shows that the country is implementing significant reforms to transition to a green economy. In particular, a number of measures are being implemented to finance

renewable energy projects, increase energy efficiency, expand cooperation with international financial institutions, and promote environmental investments. However, the underdevelopment of the green bond market, insufficient private capital mobilization, and incomplete implementation of ESG standards remain pressing challenges in this area. The literature review shows that while most scientific studies have separately studied the environmental and economic effectiveness of green finance, relatively few studies have focused on assessing its comprehensive impact in developing countries. In particular, in the case of Central Asian countries, including Uzbekistan, there remains a need to empirically assess the relationship between economic growth, investment, and environmental sustainability. This study aims to fill this scientific gap.

The main objective of this study is to assess the impact of green finance on economic development and environmental sustainability in developing countries, as well as to identify current trends in this area. The study used an integrated approach that combines qualitative and quantitative analysis methods.

The empirical basis of the study is formed by statistical data on developing countries for the period 2010–2024. In the analysis, developing countries such as Kazakhstan, the Kyrgyz Republic, Tajikistan, India, Indonesia, Brazil, and the Republic of South Africa were selected as examples, along with Uzbekistan. The selection of these countries is explained by similarities in the processes of transition to a green economy, investment activity and the level of economic development. The data used in the study were obtained from international and national statistical databases. In particular, the World Bank's World Development Indicators (WDI) database, data from the International Monetary Fund (IMF), OECD, Climate Policy Initiative (CPI), International Energy Agency (IEA) and open data from relevant national statistical agencies were used. These sources allow us to ensure the reliability of the research.

The following key indicators were used in the research:

- Gross Domestic Product Growth (GDP Growth);
- Green Investment Volume;
- Share of Renewable Energy Consumption;
- Carbon Dioxide (CO₂) Emissions;
- Foreign Direct Investment (FDI);
- Energy Efficiency Indicators;
- Funds Raised through Green Bonds.

These indicators allow for a comprehensive assessment of the economic and environmental outcomes of green

finance. The research methodology used comparative analysis, statistical analysis, trend analysis, induction and deduction methods, as well as econometric modeling. First, descriptive statistics were calculated for the variables, and their interdependence was assessed using correlation analysis. Then, a regression model was used to determine the impact of green finance on economic growth.

The following econometric model is recommended for empirical analysis:

$$GDP = \theta_0 + \theta_1 GF + \theta_2 RE + \theta_3 FDI + \theta_4 CO_2 + \theta_5 EI + \epsilon$$

where:

- GDP – economic growth rate;
- GF – green finance volume;
- RE – renewable energy share;
- FDI – foreign direct investment;
- CO₂ – carbon dioxide emissions;
- EI – energy intensity;
- ϵ – random error.

When estimating model parameters, the OLS (Ordinary Least Squares) method and Fixed Effects and Random Effects models for panel data can be used. The Hausman test is recommended to determine the best option among the models. Also, the Variance Inflation Factor (VIF) is used to determine multicollinearity, the Breusch–Pagan test to check heteroscedasticity, and the Wooldridge test to determine autocorrelation. Data processing and econometric analysis are performed using Stata 17, Microsoft Excel, and, if necessary, R Studio.

This methodological approach allows for a scientifically based assessment of the impact of green finance on economic development and environmental sustainability in developing countries and the development of practical recommendations based on the results obtained. The research results showed that the role of green finance in ensuring economic development and environmental sustainability in developing countries is gradually increasing. In the countries analyzed, the increase in investments in renewable energy, energy efficiency, clean transport and other "green" projects is stimulating economic activity and at the same time helping to reduce the negative impact on the environment. According to the results of the analysis, the share of renewable energy is also relatively high in countries with a high volume of green financing. In particular, the increase in the number of solar and wind energy projects in countries that have actively attracted green investments in recent years has led to an increase in the share of renewable sources in the energy mix. This serves as an

important factor in strengthening energy security and reducing carbon dioxide emissions. The results of the empirical analysis showed a positive relationship between green financing and economic growth. The increase in the volume of green investments contributes to increasing economic activity through the creation of new production capacities, the introduction of modern technologies and the creation of new jobs. At the same time, the introduction of environmentally friendly technologies creates the opportunity to reduce production costs and use resources more efficiently. The results obtained on carbon dioxide emissions confirm the environmental efficiency of green financing. In the countries analyzed, the growth rate of CO₂ emissions has slowed as investments in renewable energy have increased. In particular, green projects implemented in the electricity and transport sectors have yielded significant results in reducing emissions.

The study also identified a number of factors that hinder the development of green finance in developing countries. In particular, the lack of long-term financial resources, underdeveloped capital markets, limited institutional capacity, and high risk aversion for investors negatively affect the growth of green investments. In addition, the fact that the market for green financial instruments is still being formed in some countries is also slowing down the development of this direction.

An analysis of the case of Uzbekistan showed that reforms to transition to a green economy are accelerating in the country. The measures being implemented to develop renewable energy sources, increase energy efficiency, and expand cooperation with international financial institutions are creating favorable conditions for the development of green finance. At the same time, there remains a need to develop the green bond market, expand the participation of private investors, and further integrate ESG principles into the activities of the financial sector.

Overall, the research findings confirm that green finance is an important tool in developing countries not only to ensure environmental sustainability, but also to stimulate economic growth, increase investment attractiveness, and support innovative development. The results show that green finance is an important tool in achieving economic and environmental goals simultaneously in developing countries. The positive correlation identified in the study is consistent with the conclusions drawn in the international scientific literature. In particular, it was observed that an increase in green investments contributes to an increase in the share of renewable energy, improved energy efficiency, and a reduction in carbon dioxide emissions. The results of the study show that green

financing does not slow down economic growth, but rather creates a solid foundation for sustainable economic development in the long term. The introduction of modern technologies, the creation of new production capacities and the promotion of innovative activities through green investments increase the competitiveness of countries. For this reason, it is appropriate to assess green finance not only as an environmental direction, but also as an important component of the economic development strategy. However, the pace of development of green finance in developing countries is not the same. In some countries, underdeveloped financial markets, weak institutional mechanisms, high levels of investor risk, and shortcomings in the regulatory framework limit the effectiveness of this direction. This indicates the need to strengthen incentive policies on the part of the state, expand cooperation with international financial institutions, and increase the participation of the private sector.

Analysis of Uzbekistan's case confirms that the country is implementing significant reforms to transition to a green economy. The results achieved in expanding renewable energy projects, increasing energy efficiency, and attracting international financial resources are assessed positively. However, developing the green bond market, wider application of ESG standards to the activities of financial institutions, and expanding banks' green lending capabilities remain priority tasks in this area.

Also, the effectiveness of green financing depends not only on the volume of financial resources, but also on their targeted and transparent allocation. Therefore, it is important to strengthen cooperation between government agencies, financial institutions and the private sector, improve the monitoring system for green projects, and regularly assess environmental performance. Based on the research results, it was found that green financing is one of the important factors in ensuring economic growth and environmental sustainability in developing countries. Green investments contribute to sustainable economic growth by developing renewable energy sources, increasing energy efficiency, reducing carbon emissions, and creating new jobs.

Analysis shows that the successful development of green finance is directly related to the institutional environment, the level of development of financial markets, public policy, and international cooperation. It has been observed that in countries where these factors are sufficiently developed, the volume of green investments and their economic efficiency are higher.

The development of green financing is also of strategic

importance for Uzbekistan. It is considered appropriate to form a green bond market in the country, expand green credit products by commercial banks, encourage the participation of private investors, and deepen cooperation with international financial institutions. In addition, the gradual introduction of ESG principles into the financial sector and improved monitoring of green investments will further increase the effectiveness of this direction. In future studies, it is appropriate to conduct a more in-depth analysis of the impact of green financing on individual sectors, including energy, agriculture, transport and industry, based on econometric models. This scientific research serves as an important scientific basis for more effective organization of the transition processes to a green economy and improvement of state policy.

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