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# CONTENTS

DIGITAL TECHNOLOGY INTEGRATION TRENDS AND CHALLENGES IN PEDIATRIC DENTISTRY .....	15
<b>Tursunov Begzod Sherzodovich, Solijonov Sherzod Qahramonovich</b>	
THE ROLE OF RISKS AND RISK MANAGEMENT IN MANAGING THE SOLVENCY OF INSURANCE COMPANIES .....	20
<b>Xalikulova Shirin Utkir qizi</b>	
INVESTMENT OPPORTUNITIES IN THE SECURITIES MARKET OF UZBEKISTAN: DIVIDEND YIELD, INSTITUTIONAL REFORMS AND INTERNATIONAL ATTRACTIVENESS.....	25
<b>Akhliyor Ibragimov</b>	
A CONCEPTUAL APPROACH TO ANTI-MONOPOLY CONTROL IN SERVICE INDUSTRIES ADAPTED TO THE CONDITIONS OF UZBEKISTAN.....	30
<b>Bekbutayev Nodirjon Fayzullayevich</b>	
TECHNOLOGICAL FEATURES OF WEAR-RESISTANT SURFACING OF METALLIC COMPONENTS ALLOYED WITH CARBON, MANGANESE, AND SILICON USING FUSED FLUXES.....	35
<b>Khudoyorov Sardor Sadullaevich, Khudoykulov Nurilla Zikirillaevich</b>	
ECONOMIC EFFICIENCY OF IMPLEMENTING INTEGRATED MARKETING COMMUNICATIONS IN ENTERING NEW MARKETS IN UZBEKISTAN .....	39
<b>Baqoyev Sunnatillo Burxon o'g'li</b>	
ENVIRONMENTALLY EFFICIENT FATLIQUORING AGENTS IN KARAKUL FATLIQUORING TECHNOLOGY.....	46
<b>Rustamov Bobir Ismatovich, Shodieva Dilnoza Turajon qizi</b>	
STRATEGIC PLANNING IN IMPROVING THE METHODOLOGY FOR MANAGING INVESTMENT PROJECTS IN THE TEXTILE INDUSTRY.....	51
<b>Qurbonov Jasurbek Pozilovich</b>	
FOUNDATIONS OF ENGLISH TEACHING BASED ON PROVERBS (UZBEK AND AFGAN WORDS).....	56
<b>Samadi Nooria</b>	
MATHEMATICAL MODELING AND SOLUTION ALGORITHMS OF GEOMETRIC PROBLEMS IN NUMERICALLY CONTROLLED MACHINES.....	60
<b>Khasanov Bobirmirzo Makhmudali ugli, Yusupov Sardorbek Ma'rufovich, Abdullajonov Asadbek Sherzodbek ugli</b>	
INNOVATION IS A KEY FACTOR IN THE DEVELOPMENT OF THE ENERGY INDUSTRY.....	70
<b>Gavkhar Absamatovna Khamdamova</b>	
MARKETING PROBLEMS IN THE INTERNATIONAL INDUSTRIAL ENTERPRISE MARKET AND FOREIGN EXPERIENCE IN SOLVING THEM.....	76
<b>Usmanova Dilfuza Ilhomovna</b>	
FUZZY ROBUST CONTROLLERS FOR GAS PURIFICATION PROCESSES.....	82
<b>Sh. D. Tulyaganov</b>	
METHODOLOGICAL PROBLEMS OF MARKETING IN FURNITURE ENTERPRISES IN THE CONTEXT OF THE IMPLEMENTATION OF THE NEW UZBEKISTAN DEVELOPMENT STRATEGY .....	87
<b>Musayeva Shoirazimovna</b>	
THE ROLE OF METHODOLOGICAL COMPETENCE IN FUNDAMENTALIZING THE PROFESSIONAL PREPARATION OF FUTURE ECONOMICS TEACHERS .....	92
<b>Djumanazarova Zamira Kojabayevna</b>	
MAHALLIY BUDJET DAROMADLARI BARQARORLIGINI TA'MINLASH YO'NALISHLARI .....	97
<b>Isoqov Zafarjon Zokirjonovich</b>	
LIQUIDITY PROVISION IN BANKS THROUGH EFFECTIVE ASSET-LIABILITY MANAGEMENT.....	101
<b>Sulaymanov Samandarboy Adhambek ugli</b>	
EFFECTIVENESS OF THE "MANAGEMENT CERTIFICATE" SYSTEM IN THE PROFESSIONAL DEVELOPMENT OF PRE-SCHOOL EDUCATION SYSTEM LEADERS AND MECHANISMS FOR ITS IMPROVEMENT .....	108
<b>Mamatqulova Shoxsanam Dilshodovna</b>	

REGIONAL DISPARITIES IN SMALL BUSINESS DEVELOPMENT: A CLUSTER AND INDEX ANALYSIS.....	114
<b>Akbarova Barno Shukhratovna</b>	
INSTITUTIONAL COORDINATION AND TOURISM GOVERNANCE IN UZBEKISTAN: A THEORETICAL AND EMPIRICAL ANALYSIS.....	119
<b>Akkulov Abdulaziz Uralbaevich</b>	
USE OF ECONOMETRIC FORECAST INDICATORS IN MANAGING THE COMPETITIVENESS OF FOOD INDUSTRY ENTERPRISES .....	124
<b>Xusanova Gavhar</b>	
STRATEGY FOR DEVELOPING INCLUSIVE FINANCING IN THE MANAGEMENT OF COMMERCIAL BANKS AND ITS INSTITUTIONAL FOUNDATIONS .....	130
<b>Rajabov Oybek Panjievich</b>	
SCENARIO ANALYSIS OF IMPROVING THE ENERGY EFFICIENCY OF UZBEKISTAN'S ECONOMY UNDER CONDITIONS OF UNCERTAINTY.....	134
<b>Muslimova F.S., Khashimova N.A.</b>	
SCIENTIFIC AND THEORETICAL VIEWS ON THE FINANCING OF PROJECTS BASED ON PUBLIC-PRIVATE PARTNERSHIP .....	141
<b>Ergashev Ahmadjon</b>	
THE INFLUENCE OF TAX INCENTIVES ON INNOVATION IN INDUSTRIAL ENTERPRISES.....	146
<b>Bahriddinov Nodirbek Zamirdinovich</b>	
KORXONALARDA SOTISH TIZIMINI TASHKIL ETISH VA TAKOMILLASHTIRISH.....	150
<b>Abduxalilova Laylo Tohtasinovna</b>	
CRITERIA FOR EVALUATING THE EFFECTIVENESS OF MARKETING ACTIVITIES IN CONSTRUCTION MATERIALS MANUFACTURING ENTERPRISES .....	156
<b>Uzakova Umida Ruziyevna</b>	
INFLATION, ECONOMIC GROWTH, AND UNEMPLOYMENT: REVISITING THE PHILLIPS AND OKUN FRAMEWORKS IN THE CONTEXT OF JOB CREATION .....	163
<b>Zakhidov Azizbek Rustamovich</b>	
SPECIFIC ASPECTS OF DIGITALIZING RETAIL LENDING PROCESSES IN COMMERCIAL BANKS .....	172
<b>Akhmedova Dilrabo Kurbondurdi-qizi</b>	
IMPROVING MODELS FOR CONDUCTING ENVIRONMENTAL AUDITS.....	177
<b>Abdullayev Khurshidjon Nazrullo ugly</b>	
ORGANIZATIONAL ACTIVITIES OF INFORMATION RESOURCE CENTERS IN HIGHER EDUCATION INSTITUTIONS .....	184
<b>Pirmedova Khayitgul Muxammedovna</b>	
INTRODUCING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN ACCOUNTING AND AUDITING: OPPORTUNITIES AND LIMITATIONS.....	189
<b>Utegenova Sarbinaz Turdimuratovna, Bekniyazov Ajiniyaz Dauletnyazov</b>	
ENHANCING THE MECHANISMS OF PROJECT-BASED FINANCING FOR INVESTMENT PROJECTS IN COMMERCIAL BANKING INSTITUTIONS .....	193
<b>Abdurazakova Nasiba Sultanovna</b>	
ASSESSMENT OF PHYSIOLOGICAL WORKLOAD OF WORKERS DURING THE PROCESS OF OPENING THE BOTTOM HATCHES OF A GONDOLA (SEMI-OPEN) RAILWAY WAGON.....	197
<b>Toshtemirov Inomjon Muqimjonovich, Yusupov Azizjon Kahramonovich</b>	
APPROACHES TO ENSURING THE FINANCIAL SECURITY OF TBC BANK AND THE ROLE OF INNOVATIVE TECHNOLOGIES IN THIS PROCESS .....	203
<b>Abduraxmanova Gulnora Kalandarovna, Maxmudova Muxlisa Qodirjon qizi</b>	
THEORETICAL FOUNDATIONS OF THE FINANCIAL INDEPENDENCE OF LOCAL BUDGETS AND CRITERIA FOR ITS ASSESSMENT.....	209
<b>Muxitdinov Sidikkhoja Akobirkhoja ugly</b>	
THE ROLE OF FOREIGN INVESTMENTS IN ENSURING SUSTAINABLE ECONOMIC GROWTH IN UZBEKISTAN .....	215
<b>Kholov Sherali Akhrorboyevich</b>	

A METHODOLOGICAL FRAMEWORK FOR AI-BASED REPUTATION MONITORING OF COUNTRY’S INTERNATIONAL IMAGE ACROSS TOURISM, INVESTMENT, EDUCATION, AND DIPLOMACY CHANNELS: EXPERIENCE OF COUNTRIES SUCH AS SWEDEN, JAPAN, SOUTH KOREA, SINGAPORE ..... 220  
**Kurolov Maksud Obitovich**

WAYS TO INCREASE THE EFFICIENCY OF USING «GREEN ENERGY» IN DEVELOPING THE ECONOMY OF COUNTRY ..... 228  
**Saidov Mash'al Samadovich**

# WAYS TO INCREASE THE EFFICIENCY OF USING «GREEN ENERGY» IN DEVELOPING THE ECONOMY OF COUNTRY

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**Annotatsiya:** This article comprehensively analyzes the issues of improving the efficiency of the use of "green energy" in the sustainable development of the country's economy. As part of the study, the impact of renewable energy on economic growth, energy security and investment processes has been studied. Based on international statistics dating back to 2020-2024, renewable energy capacity, investment and grid cross-section shares have been analyzed. Also, the research of foreign and domestic scientists has been critically reviewed and the role of institutional, financial and technological factors in the development of the industry has been substantiated. The results of the study show that the development of renewable energy sources is important in diversifying the national economy, creating new jobs, ensuring environmental sustainability, and increasing the attractiveness of investment. The article developed practical proposals and recommendations to improve the efficiency of the use of green energy.

**Kalit so'zlar:** green energy, renewable energy sources, economic growth, energy security, investment efficiency, sustainable development, energy efficiency, innovation technologies, public-private partnership, environmental sustainability.

## INTRODUCTION

The current stage of world economic development is directly related to the efficiency of energy resources use. The expansion of industrial production, the introduction of digital technologies, the development of transport and infrastructure systems are constantly increasing the demand for energy. At the same time, the limited availability of traditional fuel sources - oil, gas and coal - and the large emissions of harmful substances into the atmosphere as a result of their use are exacerbating environmental problems. Climate change, global warming, air pollution, etc. are negatively affecting the qualitative indicators of economic growth.

In this context, the development of «green energy» based on renewable energy sources is considered not only an environmental but also an economic necessity. Sources such as solar, wind, hydropower, biomass and geothermal energy are constantly replenished in nature and practically do not emit harmful emissions into the atmosphere during their use. Such an approach allows for the sustainable development of economic activity, the introduction of resource-saving technologies and the protection of the interests of future generations.

The economic importance of "green energy" is also explained by the fact that it gives impetus to the development of innovative technologies. Solutions such as solar panels, wind turbines, energy storage systems, "smart grids" allow creating high added value. This increases the competitiveness of the national economy by strengthening industrial cooperation, expanding local production, and stimulating research and development activities.

At the same time, the transition to green energy also poses certain challenges. Factors such as high initial investment costs, dependence on imported technologies, insufficiently developed infrastructure, and a shortage of personnel can hinder the rapid development of the sector. Therefore, it is important to develop a comprehensive and systematic approach in this area.

In the current global economic climate, the issue of efficient use of energy resources and ensuring sustainable development is gaining strategic importance for every country. The constant increase in world energy consumption, the limitation of traditional fuel reserves and the aggravation of environmental problems require fundamental changes in the energy sector. In particular, global threats associated with climate change have created the need to reconsider the priorities of economic policy.

In recent years, a number of initiatives have been put forward at the international level to reduce carbon emissions, increase energy efficiency and expand the share of renewable sources. In particular, according to the analysis of the International Energy Agency, the share of renewable sources in the global energy system is increasing year by year. The International Renewable Energy Agency also notes that the green energy sector is one of the fastest growing sectors in terms of attracting investment and creating new jobs.

The relevance of the topic is determined, first of all, by the need to ensure energy security in the country's economy. High dependence on energy imports poses a threat to the stability of the national economy. Price fluctuations, political and economic instability in foreign markets can negatively affect the domestic market. The development of renewable energy sources, on the other hand, allows for the widespread use of domestic resources and increases stability against external influences.

Secondly, environmental factors further increase the relevance of the topic. The increase in the volume of harmful gases emitted into the atmosphere has a negative impact on public health, agricultural productivity, and the overall ecological balance. Green energy, on the other hand, serves to protect the environment and rationally use natural resources. This, in turn, has a positive effect on increasing social well-being and reducing medical costs.

Thirdly, this topic is also important from the point of view of economic diversification and innovative development. The renewable energy sector increases the demand for new technologies, scientific developments and highly qualified personnel. This will strengthen the competitiveness of the national economy by expanding industrial cooperation, developing small and medium-sized businesses and creating new jobs.

Fourth, in the context of global economic integration, the issue of fulfilling international obligations is also important. Many countries have joined international agreements to combat climate change. To implement these obligations, it is necessary to increase the share of green energy. This will positively affect the country's image in the international arena and its investment attractiveness.

Thus, the issue of increasing the efficiency of the use of "green energy" is not only an environmental or energy problem, but also a broad economic, social, and institutional task.

## REVIEW OF LITERATURE ON THE TOPIC

The issue of green energy development and its impact on economic growth has been studied by foreign and domestic scholars based on various theoretical and empirical approaches. This literature can be conditionally divided into three groups: the impact of green energy on macroeconomic growth; the effectiveness of investment and financial mechanisms; institutional and regulatory factors.

One of the fundamental studies in the field of energy economics is the report by N. Stern on the economics of climate change. The author proves that the economic benefits of taking measures to combat climate change are much lower than the costs of delaying it.[1] However, this study mainly presents global-level assessments and does not sufficiently explain the specific mechanisms within national economies.

In his research, J. Sachs considers green energy as a key factor in economic transformation within the framework of the concept of sustainable development. He believes that the transition to renewable energy requires not only environmental, but also institutional reforms.[2] However, the author's approach is based more on political-economic recommendations, and specific empirical modeling work is limited.

The International Energy Agency's reports analyze the share of renewable energy in the global energy balance and investment dynamics. The reports are based on economic efficiency indicators, including the competitiveness of solar and wind energy through the LCOE (Levelized Cost of Energy) indicator.[3] However, these analyses are based mainly on data from developed countries.

The International Renewable Energy Agency has provided in-depth studies on the employment and investment impacts of green energy, noting that the number of jobs created in renewable energy sectors is growing faster than in conventional energy.[4] However, the reports do not fully address the problem of technology import dependency in developing countries.

Among the empirical studies, the panel data analysis conducted by Apergis and Payne is noteworthy. The authors found a bidirectional causal relationship between renewable energy consumption and economic growth.[5] However, the study did not take into account the effects of institutional factors and market reforms.

Local scientists have also carried out a number of works on the issue of renewable energy. In particular, Sh. Mustafakulov, in his research, analyzed the economic foundations of the development of solar energy in the conditions of Uzbekistan. The author estimated the country's high solar radiation potential based on calculations and showed the effectiveness of investment.[6] However, the study did not cover in depth the mechanisms of financial risk sharing.

B. Kholmurodov, in his scientific research, analyzed projects implemented on the basis of public-private partnerships in the energy sector and substantiated the importance of the legal framework and tariff policy. According to the author, strong institutional guarantees are necessary for the formation of a stable investment environment.[7] At the same time, the study considered the issue of developing a competitive environment to a limited extent.

Some local studies have analyzed the issue of energy efficiency in industrial enterprises. For example, in the studies conducted by D. Rakhimov, empirical data have been shown that the introduction of energy-efficient

technologies leads to a decrease in production costs and an increase in product competitiveness.[8] However, in these studies, an integrated approach between renewable energy and energy efficiency is insufficient.

A number of prominent scholars have conducted in-depth studies on the impact of green energy on economic growth, investment efficiency, and institutional reform. Below, some important scientific works are critically and analytically reviewed.

In a study by R. Gross, P. Heptonstall and others, a comparative analysis of renewable energy support mechanisms was conducted. The authors studied the effectiveness of feed-in tariffs, quotas and certification systems in attracting investment. According to the results of the study, long-term feed-in tariffs are the most sustainable means of stimulating private investment.[9] However, the possibility that this approach may increase the burden on the state budget has not been sufficiently analyzed.

A study by M. Marques and J. Fuinhas analyzed the relationship between renewable energy policies and economic growth in the European Union using econometric modeling. The authors argue that institutional quality and political stability are crucial for the development of green energy.[10] However, the study mainly relies on data from developed economies, and does not provide in-depth coverage of the conditions in developing countries.

A study by A. Aghion et al. analyzed the impact of "green innovation" on economic growth. They found that government incentives for R&D and carbon taxes accelerate technological transformation.[11] The strength of the study is that it reveals the relationship between innovation and the competitive environment. However, the study did not take into account the limited financial resources in small economies.

In his research, Q. Abdurakhmonov analyzed the opportunities for creating new jobs in the labor market through the development of renewable energy. The author emphasizes that the green energy sector will increase the demand for highly qualified personnel.[12] However, the training system and mechanisms for adjusting educational standards are not sufficiently developed.

In his scientific research, N. Yuldashev studied the issues of liberalizing the energy market and improving tariff policy. He believes that the introduction of market mechanisms will improve the investment climate and increase competition.[13] However, the study did not adequately analyze social protection mechanisms and the impact on low-income groups of the population.

S. Karimova's research has examined the socio-economic benefits of solar and wind energy in rural areas. The author argues that improved energy supply can stimulate rural entrepreneurship.[14] However, the long-term financial sustainability and maintenance costs of the projects have not been fully assessed.

## RESEARCH METHODOLOGY

In the process of researching ways to increase the efficiency of using «green energy» in the development of the country's economy, comparative analysis and synthesis, induction and deduction, expert assessment, scientific abstraction, statistical grouping, correlation and regression analysis, and other methods were widely used.

Analysis and results. In recent years, the process of transition to a «green economy» has become more active internationally. In particular, the International Energy Agency reports note a consistent increase in the share of renewable energy. Also, according to the International Renewable Energy Agency's analysis, the volume of investments in the green energy sector is increasing every year, contributing to the creation of new jobs. These trends indicate that renewable energy is becoming competitive not only in terms of environmental protection, but also in terms of economic efficiency.

The issue of rational use of energy resources is also of strategic importance in the country's economy. Reducing dependence on energy imports, providing the domestic market with a stable electricity supply, and reducing production costs are important factors for economic stability. At the same time, the development of renewable energy sources also serves to improve regional infrastructure, strengthen energy supply in rural areas, and ensure social equality.

Table 1. Global renewable energy capacity (GW) 2020-2024

Years	Total renewable capacity (GW)	Annual added capacity (GW)	Annual growth, %
2020	3,600	-	-
2021	3,800	200	5.6
2022	4,025	225	5.9
2023	4,448	423	10.5
2024		585	15.1

Source: International Renewable Energy Agency – Renewable energy statistics 2025

According to the data presented in the table, global renewable energy capacity increased significantly during the period 2020-2024. In 2024, the total capacity reached 4,448 GW, with an annual growth rate of 15.1%, which is a record high. The amount of capacity added each year also continues to grow; the figures for 2023 and 2024 were very high. This, in turn, is due to the decline in the cost of green energy and political support.

Table 2. Shares by energy type in 2023–2024 by country in the world

Energy type	Share in 2024, %
Wind	39.1
Hydro	29.9
Solar	22.4
Disposal (bio and other)	8.6

Source: Eurostat Renewable electricity data 2024

According to the data presented in the table, in 2024, wind energy will have the largest share of global renewable energy (39.1%), followed by hydropower (29.9%) and solar (22.4%). These figures show the balance of renewable energy between different technologies, and despite the rapid growth of solar energy, wind and hydropower will still play a major role in traditional sources.

Table 3. Global renewable energy investment and job trends 2020-2023

Years	Global investment (\$ billion)	Jobs in green energy (million people)
2020	300	10
2021	350	11
2022	495	13.7
2023	510	14.5

Source: General trends based on REN21 and Our World in Data

According to the data presented in the table, the level of investment in the green energy sector increased significantly from 2020 to 2023. In 2022, investment amounted to \$ 495 billion, and the number of jobs also increased. This trend indicates that green energy is increasing its economic efficiency - new jobs are being created and economic activity is increasing.

The following conclusions can be drawn from the analysis of the above tables:

1. The importance of capacity growth. The growth rates recorded by global renewable energy capacity in 2020-2024 have had a positive impact on economic processes, while expanding the boundaries of energy networks. The large annual capacity additions have allowed for the stabilization of electricity prices and the reduction of carbon emissions.

2. Share of energy types. Wind and solar power make up the majority of renewable energy worldwide. These technologies are economically competitive and are becoming attractive investment destinations in many countries.

3. Investment and jobs. The growth in investment and jobs demonstrates that green energy is contributing to sustainable development. These trends are increasing the need for new businesses, research and development, and highly skilled professionals in countries.

This analysis identifies key areas for the effective introduction and development of renewable energy in the country's economy. Economic growth can be achieved through strategic investments, a favorable policy environment, and the introduction of technologies.

## CONCLUSION AND SUGGESTIONS

Theoretical analyses conducted within the framework of the study, a critical study of the works of foreign and domestic scientists, and analyses based on statistical data for 2020-2024 show that «green energy» is a strategic direction that allows the country's economy to reach a qualitatively new level.

First, renewable energy sources are an important means of ensuring economic stability. Sharp fluctuations in the prices of traditional fuel sources on the world market can have a negative impact on the national economy.

Green energy, on the other hand, reduces dependence on external influences through the extensive use of domestic resources and strengthens energy security. This ensures the stability of production in the industrial, agricultural and service sectors.

Second, green energy serves as a new driver of economic growth. Renewable energy networks are based on technologies that create high added value. Areas such as solar panels, wind turbines, energy storage systems and «smart grids» serve to develop industrial cooperation, expand innovative production and create new jobs. The growth of investment and capacity in the renewable energy sector on a global scale in 2020-2024 confirms the increasing economic efficiency of this sector.

Third, it was once again confirmed that the issue of environmental sustainability is inextricably linked to economic development. Reducing harmful emissions into the atmosphere, improving air quality and rational use of natural resources have a positive impact on public health. This, in turn, has an economic impact by increasing labor productivity and reducing social costs. Thus, green energy is not only an environmental initiative, but also a mechanism for socio-economic sustainability.

Fourth, research shows that the efficiency of the sector directly depends on the institutional environment. The stability of the legislative framework, the transparency of tariff policies, the development of public-private partnership mechanisms and financial incentives determine the flow of investment. Therefore, the development of green energy requires not only the creation of technical infrastructure, but also the improvement of market institutions.

Fifth, the issue of training personnel and strengthening scientific and research capacity is a key factor in long-term sustainability. By supporting local scientific developments, developing the startup ecosystem, and expanding international cooperation, we can reduce dependence on technology imports. This will increase the competitiveness of the national economy.

At the same time, the transition to green energy needs to be gradual and systematic. Factors such as high initial investment costs, insufficient infrastructure, and technology dependence on external markets need to be carefully managed. Public policies need to strike a balance between economic efficiency, social justice, and environmental sustainability.

Overall, the research results indicate that green energy provides a solid foundation for diversifying the country's economy, accelerating innovative development, and strengthening integration into the global economic space. The comprehensive development of this sector should become an integral part of the national development strategy.

Therefore, a consistent and scientifically based policy aimed at developing «green energy» is crucial for ensuring the country's long-term economic growth, social well-being, and environmental sustainability.

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