

INNOVATION SCIENCE AND TECHNOLOGY

ISSUE 6, PART I / JUNE 2026

 Acceptance of papers



**Acceptance of
papers**

Published monthly



Topics

economics,
technology, social
sciences





EDITOR-IN-CHIEF:

Mirzaliyev Sanjar Makhmatjon ugli

DEPUTY EDITOR-IN-CHIEF:

Makhmudov Nosir Makhmudovich
DSc., Prof., Academician

DEPUTY EDITOR-IN-CHIEF:

Ochilov Bobur Bakhtiyor ugli – Senior
lecturer at TSUI

THE SCIENTIFIC-POPULAR ELECTRONIC
JOURNAL **"INNOVATION SCIENCE AND
TECHNOLOGY"** HAS BEEN REGISTERED
UNDER THE NUMBER **C-5669633** BY THE
AGENCY FOR INFORMATION AND MASS
COMMUNICATIONS (AOKA) OF THE
REPUBLIC OF UZBEKISTAN, EFFECTIVE
FROM OCTOBER 9, 2024.

CONTACTS

Phone: **+998 50 737 87 88**

Website: <https://ist-journal.uz>

Email: innovationist2025@gmail.com

The scientific electronic journal "Innovation Science and Technology" has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

Editorial board:



Sharipov Kongiratbay Avezimbetovich,
Doctor of Technical Sciences (DSc), Professor



Abdurakhmanova Gulnora Kalandarovna, Doctor of
Economic Sciences (DSc), Professor



Cham Tat Huei,
Doctor of Philosophy (PhD), Professor (Malaysia)



Muhammad Imran Sadiq
Doctor of Philosophy in Economics (PhD), Professor,
Malaysia



Ahmed Aziz Ismail
Doctor of Technical Sciences (DSc),
Professor (Egypt)



Lee Chin
Doctor of Philosophy in Economics (PhD), (Malaysia)



Asongu Simplice
Doctor of Philosophy in Economics (PhD), Cameroon



Rui Dang
Doctor of Chemistry (DSc), Professor, China



Zahoor Ahmed
Doctor of Philosophy in Economics (PhD), Turkey



Shujaat Abbas
Doctor of Philosophy in Economics (PhD), Russia



Tina A Coffelt
Doctor of Philosophy in Educational Sciences (PhD),
USA



Abdikarimova Dinara Rustamxanovna
Doctor of Economic Sciences (DSc), Professor

Kurbonbekova Mohichehra Turobjonovna
Doctor of Economic Sciences (DSc), Professor

Alimardonov Ilkhom Muzrabshokovich
Doctor of Economic Sciences (DSc), Professor



Razakova Barno Sayfieva
Doctor of Philosophy in Economics (PhD)



Khasanov Sarvar Ulugbek ugli
Doctor of Philosophy in Economics (PhD)



Kholikova Rukhsora Sanjarovna
Associate Professor (PhD)

CONTENTS

BUDGETING BASED ON THE BALANCED SCORECARD SYSTEM IN STRATEGIC MANAGEMENT ACCOUNTING.....	8
Pardaeva Shakhnoza Abdinabievna	
TURIZM SOHASIDA TARJIMA NAZARIYASINING O'RNI	13
Bahronova Charos Mirabbos qizi	
THE ROLE OF ESG PRINCIPLES AND DIGITAL TECHNOLOGIES IN THE DEVELOPMENT OF CORPORATE SOCIAL MANAGEMENT SYSTEMS	16
Shokhrukh Abdisalimovich Muratkosimov	
A COMPARATIVE SEMANTIC FIELD ANALYSIS OF "BENEFIT" ACROSS ENGLISH AND UZBEK CULTURES	23
Mohira Husanovna Divanova	
ROSSIYA TIJORAT BANKLARIDA DEPOZIT OPERATSIYALARINI RIVOJLANTIRISHNING O'ZIGA XOS JIHATLARI	30
Rahimov Akmal Matyaqubovich	
USE OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES AGAINST CYBER THREATS IN THE PUBLIC SECTOR.....	37
Nuratdinov Xushnid Begzadovich, Erejepov Kewlimjay Kaymatdinovich	
PUL-KREDIT SIYOSATI INSTRUMENTLARIDAN FOYDALANISH AMALIYOTINI TAKOMILLASHTIRISH ..	42
A.A. Ismailov	
"O'ZBEKISTON TEMIR YO'LLARI" AJNING AMALIY IQTISODIY HOLATI TAHLILI VA OPSIONLARNI ANIQLASH	48
Bobojonova Zarnigor Shokirovna	
COMPARATIVE ANALYSIS OF DEEP LEARNING ALGORITHMS FOR AUTOMATED SKIN DISEASE DIAGNOSIS FROM DERMOSCOPIC IMAGES.....	56
Nazirova Elmira Shodmonovna, Abdusalomova Shokhista Boboyor qizi	
STRATEGY FOR THE DEVELOPMENT OF THE FINANCIAL MARKET OF UZBEKISTAN IN THE CONTEXT OF DIGITAL AND GREEN TRANSFORMATION	61
Muftaydinov Mansur Kiyomidinovich	
TOURISM POTENTIAL OF UZBEKISTAN AND FINANCIAL FACTORS FOR ITS DEVELOPMENT	68
Bau Long	
CASH FLOWS OF "TERRITORIAL ELECTRIC NETWORKS" JSC: COMPREHENSIVE ACCOUNTING ANALYSIS AND METHODOLOGICAL APPROACHES TO IMPROVEMENT	75
Djuraev Davlat Djonibekovich	
MONETARY POLICY INSTRUMENTS.....	78
A.A. Ismailov	
ECONOMIC EFFICIENCY OF IMPLEMENTING INNOVATIVE TECHNOLOGIES IN THE SERVICE SECTOR OF REGIONS	83
Abdikayumov Bekzod Turdiniyozovich	
KNOWLEDGE STRATEGY AND ITS SYSTEM OF INDICATORS IN STRATEGIC MANAGEMENT ACCOUNTING.....	89
Pardaeva Shakhnoza Abdinabievna, Pardaeva Zulfizar Alimovna	
ANALYSIS OF THE REGIONAL DYNAMICS AND STRUCTURAL CHARACTERISTICS OF LABOR MIGRATION	95
Mukhtorbek Rahimboyev, Alibek Normurodov	
SUN'IY INTELLEKT ASOSIDA KREDIT RISKLARNI BAHOLOVCHI TIZIMLARNI ISHLAB CHIQISH. MIJOZ SCORE MODELI VA QARORLARNI OPTIMALLASHTIRISH	104
Olimova Mukhlisa Vohidjon qizi	
PUBLIC-PRIVATE PARTNERSHIP IN ESG IMPLEMENTATION: OPPORTUNITIES AND CHALLENGES FOR SUSTAINABLE DEVELOPMENT	111
Khusenova Mekhrangiz	

FORMATION OF MEDICAL TOURISM CLUSTERS IN THE REGION	115
Yusupova Mehribon O'ktamovna	
DIRECTIONS FOR IMPROVING THE INTEGRATION OF SCADA AND ERP SYSTEMS IN OIL AND GAS INDUSTRY ENTERPRISES	120
Abdullaev Munis Kurbonovich	
ANALYSIS OF THE EXPERIENCE OF FOREIGN COUNTRIES IN IMPLEMENTING GREEN PUBLIC PROCUREMENT AND LESSONS FOR UZBEKISTAN.....	125
Ruzimurodova Charos Ural qizi	
AGROTECHNICAL AND INNOVATIVE STRATEGIES FOR ENHANCING GRAIN PRODUCTION EFFICIENCY	129
Turayeva Gulizahro	
MINERALOGICAL OCCURRENCE OF RARE METALS IN THE INGICHKA DEPOSIT AND DEVELOPMENT OF TUNGSTEN EXTRACTION TECHNOLOGY	133
Shodiyev Abbos, Dononov Jasur, Safarov Gulomjon	
STRATEGIC DIRECTIONS OF PUBLIC-PRIVATE PARTNERSHIP COOPERATION IN THE GREEN ECONOMY OF UZBEKISTAN	140
Zukhra Bakhramovna Abdikarimova	
TIME MANAGEMENT IN THE CRAFT ECONOMY: STRATEGIES FOR OPTIMIZING THE TIME RESOURCES OF INDIVIDUAL PRODUCERS	148
Feruza Nazrillaevna Israilova	
DEVELOPMENT STAGES OF THE GREEN ECONOMY IN THE CONTEXT OF GLOBAL SUSTAINABILITY GOALS	154
Muminova Mokhchekhra	
FEATURES AND FACTORS OF WOMEN'S ENTREPRENEURSHIP DEVELOPMENT IN THE DIGITAL ECONOMY.....	160
Ibodullayeva Malohat Sirojiddin qizi	
MECHANISMS FOR POVERTY REDUCTION THROUGH THE DEVELOPMENT OF SMALL BUSINESS AND FAMILY ENTREPRENEURSHIP IN THE SERVICE SECTOR.....	165
Dauletmuratov Adilbay Mirzaboevich	
IMPROVING THE METHODOLOGY OF ENVIRONMENTAL AUDITING AT ENTERPRISES BASED ON A RISK-ORIENTED APPROACH AND DIGITAL EVIDENCE	171
Abdullayev Khurshidjon Nazrullo o'g'li, Khurshidjon Abdullayev	
INTEGRATION MECHANISMS OF DIGITAL ECONOMY TECHNOLOGIES INTO REGIONAL GOVERNANCE SYSTEMS	176
Kurbanova Malika Ahmad kizi	
DEVELOPMENT OF A LOGICAL-LINGUISTIC MODEL OF THE KOREAN NOUN CATEGORY AND CREATION OF A PREFIX AND AFFIX DATABASE.....	181
Yendirboyeva Zumrad Zohidjon qizi	
THEORETICAL AND INSTITUTIONAL FOUNDATIONS OF MANAGING STATE SHARES IN BUSINESS ENTITIES	186
Akmaljon Valijonov	
ENSURING OBJECT SECURITY AND ANALYZING INFORMATION SECURITY BASED ON NEURAL NETWORKS.....	190
Babayazov Saidbek Po'latovich, Sultamuratova Dilnoza Gulmuratovna	
FUNDAMENTAL METHODS FOR IDENTIFYING AI-GENERATED DATA IN ACADEMIC AND ONLINE PUBLICATIONS USING MACHINE LEARNING AND NLP MODELS.....	196
Abdullaev Munis Kurbonovich, Kungratov Ilmurod Kuzibay ugli	
QUALITY ASSURANCE OF NON-AUTOCLAVED AERATED CONCRETE WITH THE ADDITION OF CMC (CARBOXYMETHYL CELLULOSE)	204
Pulatova D.G., Akhundjanov K.A.	
INTEGRATION MECHANISMS OF DIGITAL ECONOMY TECHNOLOGIES INTO REGIONAL GOVERNANCE SYSTEMS	210
Kurbanova Malika Ahmad kizi	

IMPROVING TAX ADMINISTRATION IN UZBEKISTAN AND ITS SOLUTIONS	215
Shamsiyev O'ktam Sayfitdinovich	
ASSESSING THE SOURCES AND QUALITY OF REGIONAL ECONOMIC GROWTH USING THE SOLOW MODEL.....	222
Turaev Bakhtiyor Ergashevich	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF BANKING SYSTEM DIGITALIZATION	228
Suyunov Feruz, Ergashov Firdavs, Norqulov Habibullo	
HARDWARE-AWARE PERFORMANCE OPTIMIZATION OF YOLOV8 FOR REAL-TIME APPLICATIONS: GPU ACCELERATION WITH TENSORRT AND AN ANALYTICAL FPGA COMPARISON.....	232
Ulugbek Tursunaliyev, Bakhromjon Tulkinov	
DEVELOPMENT OF SPATIAL INFORMATION MODELS OF TERRITORIAL DEVELOPMENT TAKING INTO ACCOUNT ENVIRONMENTAL FACTORS (ON THE EXAMPLE OF THE REPUBLIC OF KARAKALPAKSTAN AND THE ARAL REGION)	241
Reymova Gulmira Polatovna	
LEADERSHIP STYLES AND QUALITY ASSURANCE CULTURE IN UNIVERSITIES.....	248
Urinov Bobur Nasilloevich	
SOCIO-ECONOMIC MECHANISMS FOR ENHANCING THE EFFECTIVENESS OF SCIENTIFIC RESEARCH AND INCENTIVE SYSTEMS IN THE AGRICULTURAL SECTOR.....	256
Zafar Ibragimovich Xakimov	
SOCIOLINGUISTIC FEATURES OF NEGATIVE AESTHETIC EVALUATION UNITS DENOTING PHYSICAL APPEARANCE IN ENGLISH AND UZBEK.....	260
Qalandarova Shaxzoda Qurbonboy qizi	
REMITTANCE INFLOWS AND THE SUSTAINABILITY OF ECONOMIC GROWTH: A TIME-SERIES ANALYSIS FOR UZBEKISTAN.....	265
O. B. Gimranova	
FORECAST INDICATORS, PROSPECTS, AND OUTCOMES OF DEVELOPING THE MECHANICAL ENGINEERING INDUSTRY THROUGH GREEN INVESTMENTS.....	271
Xursandov Komiljon Maxmatkulovich	

FORECAST INDICATORS, PROSPECTS, AND OUTCOMES OF DEVELOPING THE MECHANICAL ENGINEERING INDUSTRY THROUGH GREEN INVESTMENTS

Xursandov Komiljon Maxmatkulovich

Acting Associate Professor, PhD in Economics
Tashkent State University of Economics



Abstract: In this scientific article, the strategic impact of green investments on the development of the republic's machinery industry, forecast indicators, prospects, and corresponding economic-environmental results are comprehensively studied based on a systematic analysis. Special strategic emphasis is placed on achieving carbon neutrality in industrial enterprises and the large-scale integration of resource-saving, environmentally friendly digital technologies into the production cycle. According to the research findings, a systematic increase in green investment flows serves as the primary criterion for radically reducing technical and technological risks, as well as environmental damage, ensuring the long-term competitiveness of enterprises in international and domestic markets, and establishing sustainable economic growth rates in the industry.

Keywords: green investments, machinery industry, sustainable development, carbon neutrality, eco-innovations, economic efficiency, investment forecast, digitalization.

Annotatsiya: Ushbu ilmiy maqolada yashil investitsiyalar strategiyasi va uning respublika mashinasozlik sanoati tarmog'ini rivojlantirishdagi fundamental ta'siri, prognoz ko'rsatkichlari, istiqbollari hamda unga mos keladigan iqtisodiy-ekologik natijalari keng qamrovli tarzda va tizimli tahlil yordamida o'rganilgan. Zamonaviy sharoitda sanoat korxonalarida uglerod neytralligiga erishish va resurs tejovchi, ekologik toza raqamli texnologiyalarni ishlab chiqarish sikliga keng ko'lamda integratsiya qilish masalalariga alohida strategik urg'u berilgan. Tadqiqot doirasida olingan natijalarga muvofiq, yashil investitsiya oqimlarining tizimli tarzda ko'paytirilishi texnik hamda texnologik xavflarni, shuningdek, atrof-muhitga keltiriladigan zarar darajasini tubdan kamaytirish, korxonalarning xalqaro va ichki bozorlardagi uzoq muddatli raqobatbardoshligini ta'minlash va tarmoq doirasida barqaror iqtisodiy o'sish sur'atlarini shakllantirishda bosh mezon bo'lib xizmat qiladi. Maqolada mashinasozlik majmuasining 2026–2035-yillarga mo'ljallangan rivojlanish trayektoriyalari modellashirilgan hamda institutsional va amaliy tavsiyalar majmuasi shakllantirilgan.

Kalit so'zlar: yashil investitsiyalar, mashinasozlik sanoati, barqaror rivojlanish, uglerod neytralligi, ekologik innovatsiyalar, iqtisodiy samaradorlik, investitsiyalar prognozi, raqamlashtirish.

Аннотация: В данной научной статье комплексно и на основе системного анализа исследуется стратегическое влияние зеленых инвестиций на развитие машиностроительной отрасли республики, прогнозные показатели, перспективы и соответствующие экономико-экологические результаты. Особый стратегический акцент сделан на вопросах достижения углеродной нейтральности на промышленных предприятиях и широкомасштабной интеграции ресурсосберегающих, экологически чистых цифровых технологий в производственный цикл. Согласно результатам исследования, систематическое увеличение потоков зеленых инвестиций служит главным критерием радикального снижения технических и технологических рисков, а также уровня ущерба окружающей среде, обеспечения долгосрочной конкурентоспособности предприятий на международном и внутреннем рынках и формирования устойчивых темпов экономического роста в отрасли.

Ключевые слова: зеленые инвестиции, машиностроительная промышленность, устойчивое развитие, углеродная нейтральность, экологические инновации, экономическая эффективность.

INTRODUCTION

In the third decade of the 21st century, the global economic system is undergoing unprecedented transformations. Climate change, the depletion of natural resources, and escalating environmental crises necessitate a departure from traditional industrial development models and a transition toward sustainable economic platforms. At the center of these systemic changes lies the mechanical engineering industry, which constitutes the material foundation of any national economy. The forecast indicators, prospects, and outcomes of developing the mechanical

engineering sector through green investments (within the scope of the fundamental challenges reflected in the title and illustrated in the attached image_e9c1bd.jpg file) signify not only technical modernization but also the creation of a new synergistic model that integrates environmental sustainability with economic efficiency.

In recent years, the Republic of Uzbekistan has undertaken large-scale institutional reforms aimed at the comprehensive modernization of industrial sectors, particularly the mechanical engineering complex, the introduction of advanced energy- and resource-efficient technologies into production processes, and the expansion of environmentally friendly products. Strategic programs and presidential decrees adopted by the government, including the National Strategy for the Transition to a Green Economy, have established the objective of doubling energy efficiency across all sectors of the economy by 2030 and significantly reducing greenhouse gas emissions. In this context, the mechanical engineering industry serves as a key driver with substantial multiplier effects, and its transition to green economy principles directly influences living standards, the development of cyber-physical systems, and the national export potential.

The relevance of this study stems from the fact that technological modernization processes within the national mechanical engineering industry are currently accelerating, while consistent efforts are being made to improve energy efficiency and ensure compliance with international environmental standards. Furthermore, the introduction of new global regulatory mechanisms, such as the Carbon Border Adjustment Mechanism (CBAM), creates additional opportunities to strengthen competitiveness in international markets through the broader adoption of green technologies and investments. Therefore, improving the structure of capital investments directed toward the sector and increasing the share of green investments are among the key factors ensuring the strategic sustainability and long-term development of the national economy. The objective of this scientific article is to analyze the economic foundations and current state of green investments in mechanical engineering enterprises, model development forecasts for the next decade, and identify promising strategic directions for future growth.

REVIEW OF LITERATURE ON THE SUBJECT

The concepts of the green economy and environmental investments began to receive significant attention in academic literature from the late twentieth century onward. While early theoretical perspectives regarded environmental expenditures as a factor constraining economic growth, contemporary macroeconomic schools consider green investments to be a foundation for long-term sustainability and the new technological revolution represented by Industry 4.0 and Industry 5.0. In particular, according to the hypothesis proposed by renowned economists Michael Porter and Claas van der Linde (1995), stringent environmental standards and investments directed toward their implementation stimulate innovation within enterprises, reduce resource waste, and ultimately enhance competitiveness. This perspective, widely known today as the "Porter Hypothesis," demonstrates that green investments represent not merely a cost but also a highly profitable economic instrument.

Subsequently, scholars such as David Pearce and Edward Barbier (2000) developed mechanisms for regulating the flow of green investments aimed at preserving and expanding natural capital within sustainable economic growth models. According to their findings, the transition of industrial enterprises from traditional ("brown") capital to green capital is directly linked to government tax and credit policies. Reports issued by the World Bank and the United Nations Environment Programme define green investments as a combination of public and private capital expenditures intended to reduce greenhouse gas emissions, improve energy and resource efficiency, and prevent biodiversity loss.

The challenges of green transformation in the mechanical engineering industry are also analyzed internationally within the context of Joseph Schumpeter's theory of "creative destruction" and innovation. In their research, Julia Kokina and Thomas Davenport (2017) demonstrated the impact of technological modernization, automation, and digitalization on efficiency across industrial sectors, while a new generation of researchers increasingly associates these processes with environmental transformation. For example, in countries with highly developed mechanical engineering industries, such as Germany, Japan, and South Korea, green investments have been integrated into every stage of the production chain, from raw material selection to product disposal.

As noted by Jodie Moll and Ogan Yigitbasioglu (2019), modern internet technologies and smart sensor systems enable enterprises to monitor and optimize resource consumption in real time. This, in turn, ensures greater transparency in measuring the effectiveness of green investments. Among Uzbek scholars, Associate Professor K.M. Khursandov and other local researchers have examined the structural challenges of the national industrial sector, concluding that the integration of domestic industrial enterprises into Global Green Value Chains remains relatively slow. They identify the primary reasons as the limited availability of high-quality long-term concessional financial resources and the insufficient development of sector-level forecasting systems.

RESEARCH METHODOLOGY

Methodologically, this study is based on a systems approach, macroeconomic analysis, econometric modeling, comparative analysis, and forecasting techniques. To evaluate the development trends of the mechanical engineering industry driven by green investments, a database was compiled using official statistical data for the period 2015–2025 obtained from the Statistics Agency of the Republic of Uzbekistan, the Ministry of Economy and Finance, and international organizations such as the World Bank and the International Energy Agency.

Within the scope of the research, multiple regression equations were developed to determine the impact of green investments on the gross output of the mechanical engineering sector (GO), energy efficiency (EE), and carbon intensity (CI). The general form of the model was specified as follows:

$$Y_t = \beta_0 + \beta_1 * GI_t + \beta_2 * Tech_t + \beta_3 * HC_t + \varepsilon_t$$

Here: Y_t denotes the production volume of the mechanical engineering sector (billion UZS); GI_t represents the volume of green investments directed to the sector (billion UZS); $Tech_t$ denotes the index of innovative technology implementation; HC_t represents the indicator of human capital and skilled personnel; β_0 , β_1 , β_2 , and β_3 are the model parameters; and ε_t denotes the random error term. The model parameters were estimated using the ordinary least squares (OLS) method, while their statistical reliability was tested using Student's t-test and Fisher's F-test.

In calculating forecast indicators, three alternative scenarios for 2026–2035 were considered: 1) the pessimistic (inertial) scenario, under which green investment flows and reforms continue at the current low pace; 2) the baseline (moderate) scenario, under which the targets set in state strategies are achieved at an average level; and 3) the optimistic (innovative) scenario, under which international green funds are attracted to the sector, tax and customs incentives are fully implemented, and the integration of digital ecosystems accelerates. Based on these scenarios, the technological and environmental efficiency outcomes of enterprises were forecasted.

ANALYSIS AND RESULTS

The analysis shows that in recent years, the share of green investments in the total capital investment structure of Uzbekistan's mechanical engineering sector has been increasing. Between 2018 and 2025, only 8.4 percent of more than UZS 45 trillion invested in sectoral modernization was directly allocated to green technologies, including energy-saving motors, solar panel integration, zero-waste technologies, filters, and treatment facilities. Table 1 below presents the impact indicators of various types of green investments in the sector (Table 1).

Table 1. Impact indicators of green investment types in the sector

Green investment areas	Main economic and environmental advantage	Average efficiency indicator (%)
Improving energy efficiency (eco-motors)	Reducing electricity consumption and production costs	35–45% savings
Alternative energy sources (solar panels)	Network independence and reduction of carbon footprint	20–30% autonomy
Resource-saving digital technologies	Reducing raw material waste and material costs	25–40% efficiency
Waste recycling and circular systems	Recycling metal scraps and hazardous substances	Up to 70% recycling

As can be seen from the table, investments in energy efficiency technologies represent the area with the highest and fastest returns. The introduction of eco-motors and frequency converters in industrial enterprises has made it possible to reduce electricity costs by up to 35–45 percent. At the same time, it was determined that circular economy and waste recycling systems have the potential to increase resource productivity by up to 70 percent.

Based on the developed econometric model and scenario analysis, the prospective indicators of Uzbekistan's mechanical engineering industry through 2035 were modeled. In this framework, the annual growth rate of green investments was assumed to be 18–22% under the optimistic scenario, 10–12% under the baseline scenario, and 3–5% under the pessimistic scenario. The forecast results indicate that if the innovative-optimistic pathway is adopted, the carbon intensity of the sector will decline significantly, while the gross output volume will reach an entirely new qualitative level (Table 2).

Table 2. Forecast indicators of the mechanical engineering sector through 2035

Scenario	Green Investment Volume (2035)	Reduction in Sector Energy Intensity	Export Potential Growth
Pessimistic (Inertial)	USD 1.2 billion	Reduced by 10–12%	1.5 times
Baseline (Moderate)	USD 3.5 billion	Reduced by 25–30%	2.8 times
Optimistic (Innovative)	USD 7.8 billion	Reduced by 50–55%	4.5 times

The implementation of the optimistic scenario requires comprehensive ecological modernization of the mechanical engineering industry. Under this scenario, enterprise energy consumption would be reduced by half, while CO₂ emissions per unit of output would fall to the level required by international standards. As a result, Uzbek mechanical engineering products would gain access to the markets of the European Union and other developed countries without environmental restrictions or additional carbon-related taxes, while export volumes would increase by approximately 4.5 times.

The obtained results confirm that substantial opportunities exist for expanding green investments in the mechanical engineering industry. First, green technologies require promising capital investments capable of generating long-term economic and environmental benefits. By strengthening financial stability and enhancing investment capacity, domestic enterprises can successfully implement environmental projects with payback periods ranging from seven to ten years. Second, “Green Banking” and “Green Bonds” mechanisms are gradually developing within the national banking system, and the scope of these financial instruments continues to expand.

A third important direction is the development of human capital. Significant opportunities are emerging for training highly qualified engineers, technical specialists, and IT accountants capable of operating at the intersection of mechanical engineering and environmental engineering while managing modern automated green systems. As emphasized by Cao et al. (2015) in their analysis of industrial data, the development of human capital and the implementation of effective management mechanisms in high-technology production environments contribute significantly to improving both environmental and financial outcomes. Therefore, enhancing the education system and developing modern competencies are essential prerequisites for the efficient utilization of green investments.

Based on the research findings and an assessment of international best practices, the following comprehensive measures are recommended to facilitate the active attraction of green investments into Uzbekistan’s mechanical engineering industry and achieve the projected targets:

- Expansion of tax and customs incentives: Eliminate customs duties and recycling fees on imported energy-efficient equipment, components, and green technologies, while reducing property and land tax rates by 50% for enterprises undertaking green investments for a period of five years.
- Introduction of green financing instruments: Establish a dedicated “Green Industry Fund” with the participation of the Central Bank and commercial banks. Through this fund, provide long-term concessional loans (10–15 years) for environmental projects in mechanical engineering enterprises at annual interest rates not exceeding 5–7%.
- Creation of an institutional ecosystem and national standards: Define phased implementation procedures for the mandatory adoption of international standards such as ISO 14001 (Environmental Management Systems) and ISO 50001 (Energy Management Systems) within domestic mechanical engineering enterprises, while clarifying sector-specific criteria within the national Green Taxonomy framework.
- Human capital development and synergy: Launch joint master’s degree and professional development programs in “Green Industrial Engineering and Economics” through cooperation among Tashkent State University of Economics, Tashkent State Technical University, and leading foreign higher education institutions.

As highlighted in Deloitte’s 2022 report, in systems where public-private sector cooperation functions effectively, the impact of green investments becomes visible two to three times faster. The installation of digital monitoring systems at mechanical engineering plants to ensure transparency in environmental auditing represents one of the most important drivers for strengthening investor confidence.

CONCLUSIONS AND SUGGESTIONS

This comprehensive study on the forecast indicators, prospects, and outcomes of developing the mechanical engineering industry through green investments makes it possible to formulate the following fundamental conclusions:

Green investments constitute the strategic foundation for transitioning from traditional industrial systems to a sustainable, resource-efficient, and environmentally secure economic model. As demonstrated within the framework of the Porter Hypothesis, environmental modernization is not an additional burden for enterprises but rather a key factor in ensuring long-term competitiveness.

The results of econometric modeling indicate that the adoption of the innovative-optimistic scenario in Uzbekistan's mechanical engineering industry through 2035 would enable a 50–55% reduction in sectoral energy intensity, eliminate carbon tax-related risks, and increase the export potential of manufactured products by approximately 4.5 times.

Achieving these strategic objectives requires government support through subsidies, targeted incentives, the development of a national industrial taxonomy, and the integration of advanced international standards. Furthermore, the development of a workforce training system capable of producing specialists with modern knowledge and skills is the primary guarantee of the effective utilization of green capital.

As directions for future applied research, it is advisable to explore the integration of artificial intelligence and blockchain technologies into green auditing systems and to deepen microeconomic empirical analyses using specific mechanical engineering enterprises—such as those in the automotive and agricultural machinery industries—as case studies.

References:

1. Bloom, B. S. (1984). The 2 sigma problem. *Educational Researcher*, 13(6), 4–16.
2. Cao, M., Chychyla, R., & Stewart, T. (2015). Big Data Analytics in Financial Statement Audits. *Accounting Horizons*, 29(2), 423–429.
3. Davenport, T. H., & Ronanki, R. (2018). Artificial Intelligence for the Real World. *Harvard Business Review*, 96(1), 108–116.
4. Deloitte Insights. (2022). Audit Innovation: AI-Powered Auditing and Its Impact on Risk Management. Deloitte Global Report.
5. Kokina, J., & Davenport, T. H. (2017). The Emergence of Artificial Intelligence: How Automation Is Changing Auditing. *Journal of Emerging Technologies in Accounting*, 14(1), 115–122.
6. Luo, J., Meng, Q., & Cai, Y. (2018). Analysis of the Impact of Artificial Intelligence Application on the Development of Accounting Industry. *Open Journal of Business and Management*, 6(4), 850–856.
7. Moll, J., & Yigitbasioglu, O. (2019). The role of internet-related technologies in shaping the work of accountants. *British Accounting Review*, 51(6), 100833.
8. Munoko, I., Brown-Liburd, H. L., & Vasarhelyi, M. (2020). The Ethical Implications of Using Artificial Intelligence in Auditing. *Journal of Business Ethics*, 167(2), 209–234.
9. O'zbekiston Respublikasi Prezidentining 2022-yil 2-dekabrdagi "2030-yilgacha O'zbekiston Respublikasining "yashil" iqtisodiyotga o'tishiga qaratilgan islohotlar samaradorligini oshirish bo'yicha chora-tadbirlar to'g'risida"gi PQ-436-son qarori // URL: <https://lex.uz/docs/-6303230>
10. Pearce, D., & Barbier, E. (2000). *Blueprint for a Sustainable Economy*. Earthscan Publications, London.
11. Porter, M. E., & van der Linde, C. (1995). Toward a New Conception of the Environment-Competitiveness Relationship. *Journal of Economic Perspectives*, 9(4), 97–118.
12. PricewaterhouseCoopers. (2023). *Global Artificial Intelligence and Green Technology Study: Exploiting the Sanoat 4.0 Revolution*. PwC Report.
13. Quattrone, P. (2016). Governing Social Orders, Unfolding Rationality, and Jesuit Accounting Practices. *Administrative Science Quarterly*, 60(3), 411–445.

Proofreader: Zokir ALIBEKOV

Layout and Designer: Oloviddin Sobir ugli

2026. № 6

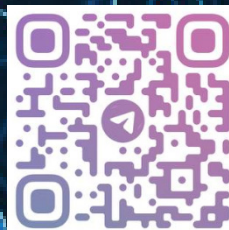
© When materials are reproduced, the INNOVATION SCIENCE AND TECHNOLOGY journal must be cited as the source. Authors are responsible for the accuracy of the information in materials and advertisements published in the journal. Editorial opinions may not always align with those of the authors. Submitted materials will not be returned to the editorial office.

To publish articles in this journal, you may submit articles, advertisements, stories, and other creative materials through the following links. Materials and advertisements are published on a paid basis.

You may subscribe to the journal at any time using the following details. Once subscribed, please send a screenshot or photo of your payment confirmation to our Telegram page @iqtisodiyot_77. Based on this, we will send the latest issue of the journal to your address each month.

“The journal “INNOVATION SCIENCE AND TECHNOLOGY” has been registered by the Agency for Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan from 09.10.2024 under the registration number №390637. License number: C-5669633. PNFL: 30407832680027

Our address: Tashkent city, Yunusobod district, 19th block,
House 17.



Acceptance of articles

Published every
monthly



Directions

Social, economic, political,
technological, scientific



Scopus || Scientific electronic journal specializing in Scopus

CERTIFICATE NUMBER: №390637

**ORDER NUMBER ACCORDING TO
THE LICENSE REGISTER: C-5669633**

CONTACT:



Contact us
+998 50 737 87 88



Telegram channel
t.me/scopus_IST2100



Journal official website
<https://ist-journal.uz/index.php/IST>