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Article

Determinants of Environmental and Economic Governance Efficiency in the Context of the Green Economy Transition

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Abstract: The transition to a green economy has become a strategic priority for achieving sustainable development and long-term economic resilience. This study examines the key determinants influencing environmental and economic governance efficiency within the framework of the green economy transition. The research identifies critical factors such as institutional quality, digital governance, green investment, innovation capacity, and regulatory frameworks. A phased approach to strategic management is proposed, supported by KPI-based evaluation systems, including composite indices such as GMEI and AIMI. The findings suggest that integrating environmental and economic governance mechanisms enhances policy effectiveness, resource efficiency, and investment attractiveness. Furthermore, the study demonstrates that the application of AI-based monitoring, public-private partnerships (PPP), and cluster-based development models significantly improves governance outcomes. The results contribute to the development of a comprehensive model for strengthening governance efficiency, ensuring a balanced relationship between environmental sustainability, economic growth, and social well-being.

Keywords: Green Economy, Governance Efficiency, Environmental Sustainability, Economic Development, KPI Systems, Digital Governance, Green Investments, Institutional Reforms, PPP, AI Monitoring.

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1. Introduction

In recent decades, global economic systems have faced increasing pressure to address environmental degradation, climate change, and resource depletion. The concept of the green economy has emerged as a comprehensive framework aimed at reconciling economic growth with environmental sustainability. According to the United Nations, a green economy is characterized by low carbon emissions, resource efficiency, and social inclusiveness. The transition to a green economy requires not only technological and financial transformations but also significant improvements in governance systems. Efficient governance plays a crucial role in ensuring that environmental and economic policies are effectively designed and implemented. However, many countries face challenges related to institutional inefficiencies, lack of coordination, and insufficient monitoring mechanisms [1]. This study aims to identify and analyze the key determinants of environmental and economic governance efficiency in the context of the green economy transition. It also proposes a structured framework based on phased implementation and KPI-driven performance evaluation to enhance strategic management effectiveness.

Literature Review

The concept of the green economy has been widely discussed in academic and policy literature. The United Nations Environment Programme emphasizes that green economy

policies contribute to improved human well-being and reduced environmental risks [2]. Similarly, the World Bank highlights the importance of sustainable growth models that integrate environmental considerations into economic planning [3]. Stern argues that climate change mitigation requires strong institutional frameworks and long-term policy commitments [4]. Stiglitz also underlines the role of governance quality and inclusive economic systems in achieving sustainable development [5]. Recent studies focus on the role of digital technologies and innovation in improving governance efficiency. According to OECD reports, digital governance and data-driven decision-making significantly enhance transparency and accountability [6]. Furthermore, the integration of artificial intelligence in environmental monitoring systems has been identified as a key factor in improving policy implementation and environmental control mechanisms [7]. Public-private partnerships (PPP) are also considered an important instrument for financing green projects and improving infrastructure development. The Asian Development Bank notes that PPP models facilitate investment mobilization and risk-sharing in green initiatives [8]. Despite the growing body of literature, there remains a gap in understanding the integrated impact of institutional, technological, and economic factors on governance efficiency within the green economy transition. This study seeks to address this gap by proposing a comprehensive analytical framework.

2. Methodology

This study employs a mixed-methods approach combining qualitative and quantitative analysis. The research is based on secondary data obtained from international organizations, national statistics, and policy reports. In addition, a KPI-based evaluation model is developed to measure governance efficiency across different implementation stages (2026–2035). The model incorporates measurable indicators related to environmental performance, economic growth, and digital governance. The research design ensures a comprehensive assessment of governance efficiency determinants and provides practical recommendations for policymakers and stakeholders involved in the green economy transition [9].

3. Results and Discussion

Improving governance efficiency in the context of the green economy is a multifactorial process shaped by the interaction of economic, environmental, institutional, and technological factors. A systematic analysis of these factors plays a crucial role in providing a scientific basis for managerial decision-making. Among the most significant determinants of governance efficiency are economic indicators, including the volume of investments, production efficiency, GDP growth rates, and export potential. In particular, green investments contribute to aligning economic growth with environmental sustainability. Environmental factors represent a core component of governance efficiency. Indicators such as CO_2 emission levels, waste management, and the efficiency of water and land resource utilization determine the level of ecological sustainability. Institutional factors are essential in shaping the effectiveness of governance systems. The regulatory and legal framework, public-private partnerships (PPP), transparency in governance, and anti-corruption mechanisms play a decisive role in this process. Digital technologies and innovations-such as artificial intelligence, Big Data, and the Internet of Things (IoT)-serve as key tools for improving governance efficiency. These technologies enable real-time monitoring and support data-driven decision-making. The environmental awareness, knowledge, and competencies of the population also influence governance efficiency. A high level of ecological consciousness and a skilled workforce ensure the successful implementation of green economy strategies [10]. The availability and efficient allocation of financial resources are important determinants of governance efficiency. Green finance instruments, including loans and grants, expand opportunities for financing

environmentally sustainable projects. Regional characteristics-such as natural resource endowment, geographical location, and infrastructure development-have a direct impact on governance efficiency. Therefore, a differentiated, region-specific approach is required. Innovation and research activities act as key drivers of the green economy. The introduction of new technologies enhances production efficiency while reducing environmental damage. All of the above factors are interconnected and collectively determine governance efficiency. Their synergistic interaction leads to the formation of a sustainable development model [11]. The relationships among these factors can be identified through regression and panel data models. For instance, an increase in investments is associated with improvements in environmental indicators and, consequently, higher governance efficiency.

Table 1. Factors Influencing Governance Efficiency in the Context of the Green Economy: Mechanisms of Impact and Performance Analysis.

No.	Factor	Impact (Mechanism)	Outcome (Efficiency)
1	Economic factors	Increase investment and production efficiency	GDP growth and improved competitiveness
2	Environmental factors	Ensure rational use of resources	Strengthened environmental sustainability
3	Institutional factors	Improve legal and governance systems	Increased transparency and efficiency
4	Technological factors	Enhance monitoring through AI, Big Data, and IoT	Faster and more accurate decision-making
5	Social factors	Increase environmental awareness of the population	Sustainable social development
6	Financial factors	Finance green investments	Expansion of environmental projects
7	Regional factors	Optimize resource use and infrastructure	Balanced regional development
8	Innovation factors	Introduce new technologies	Increased efficiency and innovation
9	Integration factors	Integrate factors in a comprehensive manner	Synergistic effect achieved
10	Digital governance factor	Enable data-driven governance	Improved governance efficiency

This table systematically presents the key factors influencing governance efficiency in the context of the green economy. The impact mechanism and outcome of each factor are outlined separately, reflecting the complex nature of the governance system (Table 1). The analysis shows that governance efficiency is not determined by individual factors alone, but rather by their interaction and integration. In particular, the alignment of economic, environmental, and technological factors is a fundamental condition for achieving sustainable development [12]. The results of econometric forecasting provide a scientific basis for strategic decision-making aimed at improving governance efficiency. In particular, the use of time series methods (trend models), regression analysis, and index approaches in regional development processes makes it possible to determine the future dynamics of economic indicators and enhance the accuracy of management decisions. Within the framework of this study, forecasts for 2026–2030 based on developed quadratic trend models have identified the following priority directions for improving governance efficiency: First, prospects for improving resource use efficiency are identified. According to the forecast results, along with the growth in the number of tourism facilities, the flow of tourists is expected to increase at an even faster rate. This leads to an increase in the "number of tourists per facility" (Q indicator), enabling the maximum utilization of existing infrastructure. As a result, the governance system becomes more oriented toward optimal resource allocation. Second, opportunities for optimizing investment policy are expanded. The results of the econometric model allow for the identification of priority investment areas. In particular, the need to expand infrastructure in regions with rapidly growing tourist flows is substantiated, which increases investment efficiency. Third, the effectiveness of implementing digital governance systems is enhanced. Based on the forecast results, the introduction of real-time monitoring systems enables faster and more flexible decision-making [13]. This improves governance efficiency within the framework of the Agile–Green–Digital approach. Fourth, prospects for increasing employment and social efficiency are strengthened. Forecasts indicate opportunities for creating new jobs in the tourism sector, contributing to higher income levels and ensuring regional social stability. Fifth, the risk management system is improved. Econometric forecasts allow for the early identification of potential risks and uncertainties. For example, lower-than-expected tourist flows or seasonal fluctuations enable timely adjustments to management decisions. Sixth, the integration of sustainable and green development principles is enhanced. Forecast results support the development of management decisions that take into account environmental pressures and resource consumption, thereby contributing to the formation of a governance model aligned with green economy principles. Seventh, the quality of strategic planning is improved. Long-term development scenarios based on econometric forecasts provide clear guidance for policymakers and ensure that the planning process is grounded in scientific evidence. This graph illustrates the growth trend of public-private partnership (PPP) investments in Uzbekistan, highlighting a strong and dynamic upward trajectory. According to the figure, PPP investments were almost negligible in 2019, remaining close to 0 billion USD, and reached approximately 1.7 billion USD by 2023. By 2030, this figure is projected to rise significantly to 30 billion USD [14]. Thus, while PPP investments developed slowly at the initial stage, the graph clearly reflects a rapid acceleration in subsequent years. This indicates an increasing policy focus on actively attracting private capital into strategic sectors such as infrastructure, social services, energy, transport, and коммунal services. One key aspect of the graph is that growth between 2019 and 2023 was relatively moderate. This suggests that PPP mechanisms were in their early stage of development. Typically, this phase involves establishing a legal framework, selecting projects, developing institutional mechanisms, building investor confidence, and implementing state guarantee systems. Therefore, the relatively low investment volume during this period can be interpreted as the institutional formation stage of the PPP system. The second important aspect is the sharp increase observed between 2023 and 2030. The most significant growth occurs during this period,

with investments rising from approximately 1.7 billion USD to 30 billion USD. This substantial increase indicates that PPP mechanisms may evolve from being a supplementary financing tool into one of the main investment platforms for economic modernization. Particularly in conditions of limited state budget resources, the implementation of large-scale projects through private sector participation becomes a crucial strategic solution. From an economic perspective, the graph suggests that the growth of PPP investments leads to several positive outcomes. First, it reduces the direct financial burden on the state. Second, it introduces private sector expertise, innovation, and efficiency principles into public projects. Third, infrastructure projects can be implemented more quickly and with higher quality. Fourth, in the long term, employment, regional development, and service quality are expected to improve. In this sense, the graph reflects not only financial growth but also a transformation in the economic governance model. Furthermore, the trend can be linked to governance efficiency. As PPP investments increase, the role of the state shifts from direct executor to regulator, coordinator, and supervisor [15]. This is a key feature of modern governance systems. Instead of relying solely on public resources, the state achieves results through partnerships with private investors. Consequently, project risks are shared, financial responsibilities are distributed, and service quality is enhanced through market-based mechanisms. However, caution is required when interpreting the graph. It is based on only three data points: 2019, 2023, and 2030. Therefore, it does not represent a complete statistical time series but rather a generalized trend or scenario-based forecast. Intermediate data for the years 2024–2029 are not provided. As a result, although the graph shows a sharp linear increase, real-world dynamics may be more gradual, uneven, or sector-specific. For academic purposes, it is therefore more appropriate to describe this figure as a "forecast trend" or a "general growth trajectory." Another important conclusion derived from the graph is that Uzbekistan's investment policy is gradually shifting from a centralized, state-budget-driven model toward a partnership- and market-based approach. This transition is likely to produce significant results in sectors such as energy, transport infrastructure, healthcare, education, and housing and utilities. If the projected level of 30 billion USD is achieved by 2030, it would indicate that PPP has become a well-established strategic source of investment in the country. Overall, the graph supports the following scientific conclusion: PPP investments in Uzbekistan are transitioning from an initial formation stage to a phase of rapid expansion. This process is becoming a key factor in increasing private sector participation in the economy, accelerating infrastructure modernization, and improving governance efficiency. The observed trend reflects not only financial growth but also the deepening of institutional cooperation between the public and private sectors.

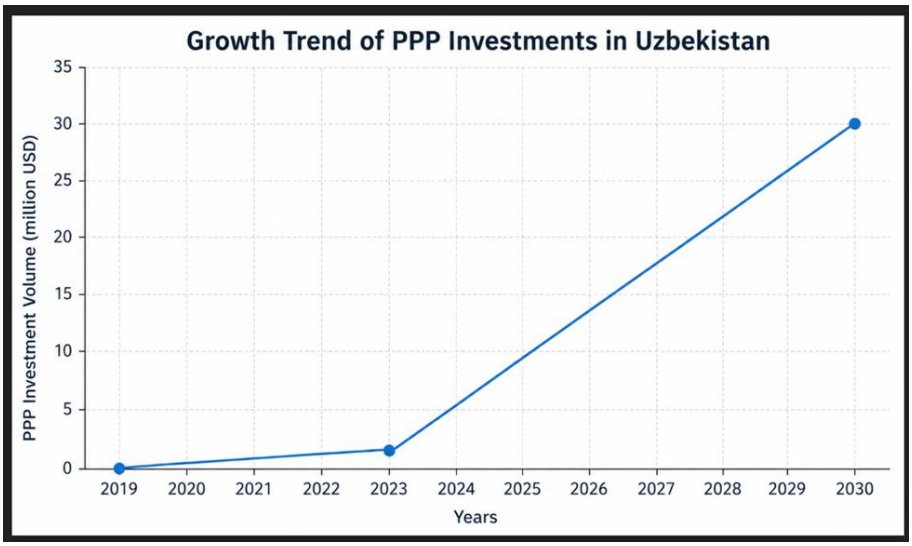

Figure 1. Growth Trend of PPP Investments in Uzbekistan.

This figure 1 illustrates a stable and accelerating growth trend in the volume of public-private partnership (PPP) investments in Uzbekistan over the period 2019–2030. Specifically, PPP investments were almost negligible in 2019, increased to approximately 1.7 billion USD in 2023, and are projected to reach 30 billion USD by 2030. This trend indicates the strengthening of PPP mechanisms at the institutional level, the expanding scope of private capital involvement in strategic sectors, and the transition toward a more efficient investment governance model in the country. The analysis shows that PPP investments in Uzbekistan are moving from an initial formation stage to a phase of rapid development. This process serves as an important factor in actively attracting private capital into the economy, accelerating infrastructure projects, and improving the efficiency of public governance. In the future, the development of PPP mechanisms will play a strategic role in ensuring sustainable economic growth and balanced regional development. Graph analysis (scientific interpretation): The graph also demonstrates the rapid development of the cluster system in Uzbekistan, particularly the activities of IT Park. The sharp year-by-year increase in the number of companies and employment levels confirms the high efficiency of the cluster mechanism. Among the most important determinants of governance efficiency are economic indicators, including the volume of investments, production efficiency, GDP growth rates, and export potential. In particular, green investments help align economic growth with environmental sustainability. Environmental factors constitute one of the core components of governance efficiency. Indicators such as CO_2 emission levels, waste management, and the efficiency of water and land resource utilization determine the level of ecological sustainability. Institutional factors represent a key element in shaping the effectiveness of governance systems. The regulatory and legal framework, public-private partnerships (PPP), transparency in governance, and anti-corruption mechanisms play a decisive role in this process. Digital technologies and innovations—such as artificial intelligence, Big Data, and the Internet of Things (IoT)-serve as important tools for improving governance efficiency. These technologies enable real-time monitoring and support data-driven decision-making. The environmental awareness, knowledge, and competencies of the population also influence governance efficiency. A high level of ecological consciousness and a skilled workforce ensure the successful implementation of green economy strategies. The availability and efficient allocation of financial resources are important determinants of governance efficiency. Green finance instruments, including loans and grants, expand opportunities for financing environmentally sustainable projects. Regional characteristics-such as natural resource endowment, geographical location, and infrastructure development—have a direct impact on governance efficiency. Therefore, a differentiated, region-specific approach is required. Innovation and research activities act as key drivers of the green economy. The introduction of new technologies enhances production efficiency while reducing environmental damage. All of the above factors are interconnected and collectively determine governance efficiency. Their synergistic interaction leads to the formation of a sustainable development model. The relationships among these factors can be identified through regression and panel data models. For example, an increase in investments is associated with improvements in environmental indicators and, consequently, higher governance efficiency. In conclusion, the factors influencing governance efficiency in the context of the green economy are complex in nature and require an integrated management approach. A comprehensive analysis of these factors contributes to improving strategic decision-making and ensuring sustainable development.

4. Conclusion

The transition to a green economy represents a complex and multidimensional process that requires the integration of economic, environmental, institutional, and technological factors. This study demonstrates that improving governance efficiency is not

the result of isolated measures, but rather the outcome of a coordinated and systemic approach in which multiple determinants interact and reinforce one another. The findings highlight that economic factors—particularly investment flows and production efficiency-play a central role in driving sustainable growth, while environmental indicators ensure the long-term viability of development. At the same time, institutional quality, including regulatory frameworks, transparency, and public-private partnerships, serves as a critical foundation for effective governance. The increasing role of digital technologies, such as artificial intelligence and data-driven systems, further enhances decision-making accuracy and operational efficiency. Moreover, the study confirms that the application of KPI-based management systems and econometric forecasting methods significantly improves the quality of strategic planning. These tools enable policymakers to evaluate performance, anticipate future trends, manage risks, and allocate resources more effectively. In particular, the growing role of PPP investments reflects a shift toward a more collaborative and market-oriented governance model, which contributes to infrastructure development, innovation, and overall economic modernization. Importantly, the results indicate that governance efficiency is achieved through the synergistic interaction of all relevant factors. Their integration leads to the formation of a sustainable development model that balances environmental protection, economic growth, and social well-being. In conclusion, the successful implementation of green economy strategies requires an integrated governance approach supported by institutional reforms, digital transformation, and strategic investment policies. Strengthening these elements will not only enhance governance efficiency but also ensure long-term competitiveness and sustainable development in the national economy.

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