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Enhancing State Audit Mechanisms for Quality Assessment and Governance of Natural Resources: Insights from the European Union Experience

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Abstract. The effective management of natural resources is a crucial aspect of state regulation, particularly in the face of increasing environmental challenges. State audit mechanisms play a key role in ensuring transparency, legality, and efficiency in resource utilization. This study examines the experience of the European Union (EU) in auditing natural resource governance and evaluates its applicability to Kazakhstan. The main objective is to analyze the effectiveness of EU auditing strategies, including monitoring under the Common Agricultural Policy (CAP) and strategic planning mechanisms. The research employs both qualitative and quantitative methods, including comparative analysis of international practices and evaluation of regulatory mechanisms. The findings highlight key principles that can be adapted for Kazakhstan, such as integrating environmental indicators into audits, establishing a dual-level strategic reporting system, enhancing public-private cooperation mechanisms, and introducing financial incentives for sustainable resource management. The practical significance of this study lies in the development of recommendations to improve Kazakhstan's state audit framework, ultimately leading to enhanced environmental policy effectiveness, improved resource governance, and long-term economic sustainability.

Keywords: State audit, quality assessment, natural resource governance, international experience, sustainability, environmental management, accountability.

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Introduction

The management of natural resources plays a crucial role in ensuring economic stability, environmental sustainability, and long-term national development. Ineffective governance in this area often leads to significant economic and ecological consequences, requiring robust oversight mechanisms. The Organisation for Economic Co-operation and Development (OECD) estimates that global inefficiencies in natural resource management result in financial losses exceeding $240 billion annually, underlining the necessity for stronger regulatory control and monitoring. State audit institutions (SAIs) are essential in evaluating how effectively governments allocate and utilize natural resources. However, many countries lack a structured audit framework tailored to resource governance, resulting in inefficiencies, mismanagement, and environmental damage. The European Union (EU) has established a sophisticated system for auditing natural resource use, integrating performance indicators, sustainability assessments, and compliance mechanisms into its policies. The Common Agricultural Policy (CAP), with an allocated budget of €387 billion for the 2021-2027 period, serves as a primary example of how state audit mechanisms can be embedded in large-scale governance frameworks to promote sustainable resource use and economic resilience.

This research focuses on examining the effectiveness of state audit mechanisms in assessing the quality and governance of natural resources, drawing insights from the European Union's institutional framework. A central aspect of the study involves analyzing the role of the European Court of Auditors (ECA) and other Supreme Audit Institutions (SAIs) in ensuring compliance with environmental policies and regulatory commitments. Particular attention is given to CAP's structured monitoring approach, which mandates annual performance reports and biannual strategic plan evaluations for all EU member states, allowing for systematic assessment and policy adjustments. Additionally, CAP policies require at least 40% of the program's budget to be dedicated to climate-related initiatives, reinforcing the link between financial support and sustainable practices. This study employs a comparative analysis of audit methodologies, incorporating both qualitative and quantitative evaluations of EU resource governance. The hypothesis underlying this research suggests that adopting EU-style performance auditing techniques in other countries can lead to significant improvements in natural resource management, enhancing transparency, accountability, and overall sustainability outcomes. The findings will contribute to advancing audit frameworks globally, ensuring better alignment between economic policies and environmental responsibilities.

Kazakhstan faces challenges in sustainably managing its natural resources, with oil, gas, and mining contributing 30% of GDP and 60% of exports. Strengthening state audit mechanisms is crucial. Adopting EU practices, Kazakhstan could integrate environmental indicators, implement biannual strategic evaluations, and allocate 25% of resource budgets to eco-schemes. Enhancing stakeholder engagement would improve transparency. These measures can boost regulatory effectiveness, sustainability, and economic stability.

Literature review

Rauschmayer F. analyzes natural energy resource management in the European Union, emphasizing state audit mechanisms in assessing consumption patterns and production

efficiency. The study highlights inconsistencies in national policies across EU member states and underscores regulatory oversight as a key factor in sustainable energy governance [2]. Giljum S. et al. explore scenarios for sustainable resource use, focusing on extraction and consumption trends [3]. The necessity of robust auditing frameworks to ensure compliance with sustainability targets and potential adjustments in resource management policies is a central theme. Christmann P. examines mineral resource governance, identifying governmental instruments regulating resource exploitation, including international audit frameworks and compliance mechanisms [4]. Strengthening state audit methodologies is presented as a means to enhance accountability and promote sustainable resource utilization.

Bringezu S. investigates sustainable resource management strategies, advocating for an integrated audit model incorporating material flow assessments and energy supply evaluation. Resource taxation and strategically designed audit policies are suggested to improve regulatory efficiency [5]. Ahmadov A.K., Van Der Borg C. assess the impact of resource availability on renewable energy production, applying a mixed-methods approach to evaluate policy implementation [6]. Akimova L. M. et al. examine socio-economic development planning in EU regions, emphasizing energy optimization and conservation policies [7]. Goldthau A. evaluates geopolitical aspects of natural gas development, considering the influence of energy security policies on audit and governance frameworks. Heaton E. A. et al. provide an extensive assessment of renewable energy production, particularly bioenergy policies and implications for state audit processes [8]. Rauschmayer F., Paavola J., Wittmer H. focus on European natural resource governance, highlighting multi-level participation in audit mechanisms and its role in reinforcing public accountability. Well-structured audit frameworks emerge as essential for improving governance efficiency and advancing long-term sustainability in resource management.

Methodology

The study uses comparative analysis of EU audit mechanisms and Kazakhstan's resource governance, combining qualitative and quantitative methods. The research question explores how Kazakhstan can enhance state audits by adopting EU best practices. The hypothesis suggests that integrating performance-based auditing, environmental indicators, and digital monitoring will improve transparency and efficiency. The study follows three stages: (1) Data Collection – analyzing EU and Kazakhstan's audit frameworks; (2) Comparative Analysis – identifying gaps and applicable reforms; (3) Recommendations – proposing policy adaptations. Methods include audit report analysis, case studies, and statistical assessments. The study's novelty lies in adapting EU audit strategies to Kazakhstan's governance system, improving resource management and accountability.

Findings and Discussion

European countries have established comprehensive and structured governance systems for managing natural resources, integrating economic sustainability, regulatory oversight, and environmental conservation. The European Green Deal, adopted in 2019, commits the EU to climate neutrality by 2050, setting ambitious targets for resource efficiency, emissions reduction, and sustainable development. A key component of this initiative is the Common Agricultural Policy (CAP), which allocates €387 billion for 2021-2027, with 40% of funds

dedicated to climate and biodiversity goals. CAP mandates annual performance reports and biannual strategic reviews, ensuring transparency and accountability in natural resource management. The EU Water Framework Directive requires member states to achieve good ecological status for all water bodies, with strict regulations on water extraction, pollution control, and conservation measures. The EU Forest Strategy 2030 promotes sustainable forestry, targeting 30% reforestation of degraded lands, while the EU Biodiversity Strategy aims to restore 3 billion trees and 25,000 km of free-flowing rivers by 2030.

Energy and mineral resource governance also play a crucial role in European policies. Norway, a leading energy producer, has developed a sovereign wealth fund worth $1.4 trillion by reinvesting oil and gas revenues into long-term sustainable assets. The UK and Denmark have significantly reduced fossil fuel dependence by investing in offshore wind energy, with Denmark generating more than 50% of its electricity from wind power. Germany has successfully transitioned towards renewable energy, with over 50% of its electricity sourced from wind, solar, and hydropower, facilitated by state subsidies and carbon pricing mechanisms. Sweden's carbon tax policy, introduced in 1991, has been highly effective, reducing CO_2 emissions by 27% while maintaining steady economic growth. In France, nuclear energy remains a dominant factor in the energy mix, supplying over 70% of electricity with minimal carbon emissions, ensuring energy security while reducing reliance on fossil fuels.

The efficient management of natural resources significantly influences Gross Domestic Product (GDP), economic stability, and long-term sustainability. In the European Union, resource governance policies such as the Common Agricultural Policy (CAP) and the EU Emissions Trading System (ETS) contribute to economic resilience, ensuring efficient allocation of funds, regulatory compliance, and environmental sustainability. The EU's GDP growth projection for 2024 is 0.9%, expected to rise to 1.5% in 2025 and 1.8% in 2026, supported by stronger domestic demand, investment recovery, and resource-efficient policies. In countries with robust state audit mechanisms, such as Germany and Sweden, renewable energy investments and green taxation have led to higher economic efficiency and long-term GDP growth (Fig.1).

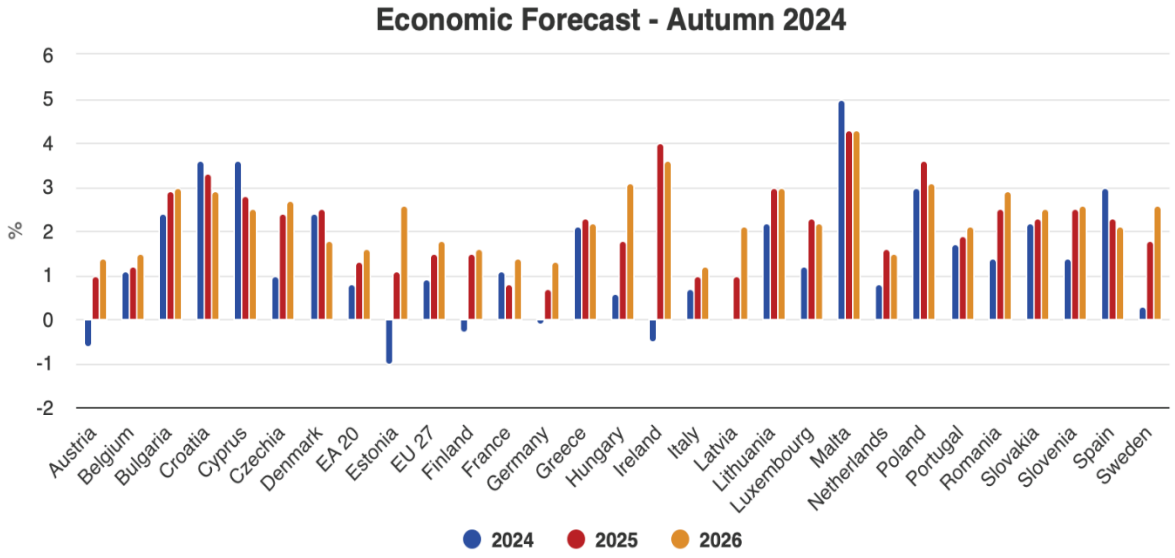

Figure 1 Economic Growth Forecast for EU Countries (2024–2026)

Source: https://economy-finance.ec.europa.eu/e

Kazakhstan's natural resource-dependent economy, where oil, gas, and mining contribute 30% of GDP and over 60% of exports, faces structural vulnerabilities due to global commodity price fluctuations and inefficiencies in resource governance. Strengthening state audit mechanisms – by integrating environmental performance indicators, conducting biannual strategic evaluations, and enforcing transparent budget allocations – can enhance economic resilience and GDP growth. Implementing EU-style performance-based audits and digital monitoring tools can reduce financial mismanagement, increase revenue efficiency, and promote green investments, supporting Kazakhstan's transition to a diversified and sustainable economy while maintaining stable GDP growth in the long term.

The European Court of Auditors (ECA) plays a central role in auditing and monitoring resource governance, ensuring compliance with EU-wide sustainability goals and financial efficiency. In 2022, ECA audits covered €53.7 billion in expenditures, identifying material errors in six out of 13 disbursements, highlighting the need for continuous oversight. The EU Emissions Trading System (ETS) is another key instrument, regulating carbon emissions by placing a cap on industrial pollution and implementing a market-based approach to emission reduction. Countries such as Finland and the Netherlands have incorporated circular economy principles, minimizing resource waste by promoting recycling, sustainable production, and efficient material use.

Table 1 Natural Resource Management Initiatives in European Countries

Country	Initiative	Description
European Union	European Green Deal	Aims for climate neutrality by 2050 with strict sustainability regulations and resource efficiency policies.
Norway	Sovereign Wealth Fund for Oil Revenues	Manages oil and gas revenues through a $1.4 trillion fund for long-term economic and environmental sustainability.
Germany	Energiewende (Energy Transition)	Transition from fossil fuels to renewables, with over 50% of electricity from wind, solar, and hydro.
Sweden	Carbon Tax Policy	Introduced in 1991, reducing CO_2 emissions by 27% while maintaining economic growth.
France	Nuclear Energy Strategy	Over 70% of electricity generated from nuclear power, reducing carbon emissions and ensuring energy security.
Denmark	Offshore Wind Expansion	Leads in offshore wind energy, with over 50% of electricity supplied from wind farms.
Netherlands	Circular Economy Strategy	Focus on waste reduction, recycling, and efficient resource use to promote sustainability.
Finland	Sustainable Forestry Management	Forest management policies ensuring reforestation, biodiversity conservation, and sustainable timber production.
United Kingdom	Net Zero Strategy	Legally binding goal to reach net-zero emissions by 2050, with strong regulatory frameworks.

Spain	Water Conservation and Drought Management	Water conservation policies to mitigate drought risks, including sustainable irrigation and desalination projects.
Note: compiled by the author		

These governance models serve as valuable benchmarks for Kazakhstan, which relies heavily on oil, gas, and mining industries, contributing 30% of GDP and 60% of exports. By integrating EU-style environmental audit mechanisms, performance-based monitoring, and stricter sustainability regulations, Kazakhstan can improve resource efficiency, reduce environmental degradation, and enhance public accountability in state audit processes. Implementing green budgeting strategies, eco-schemes, and carbon pricing mechanisms, as seen in Europe, can significantly strengthen Kazakhstan's resource governance and long-term economic stability.

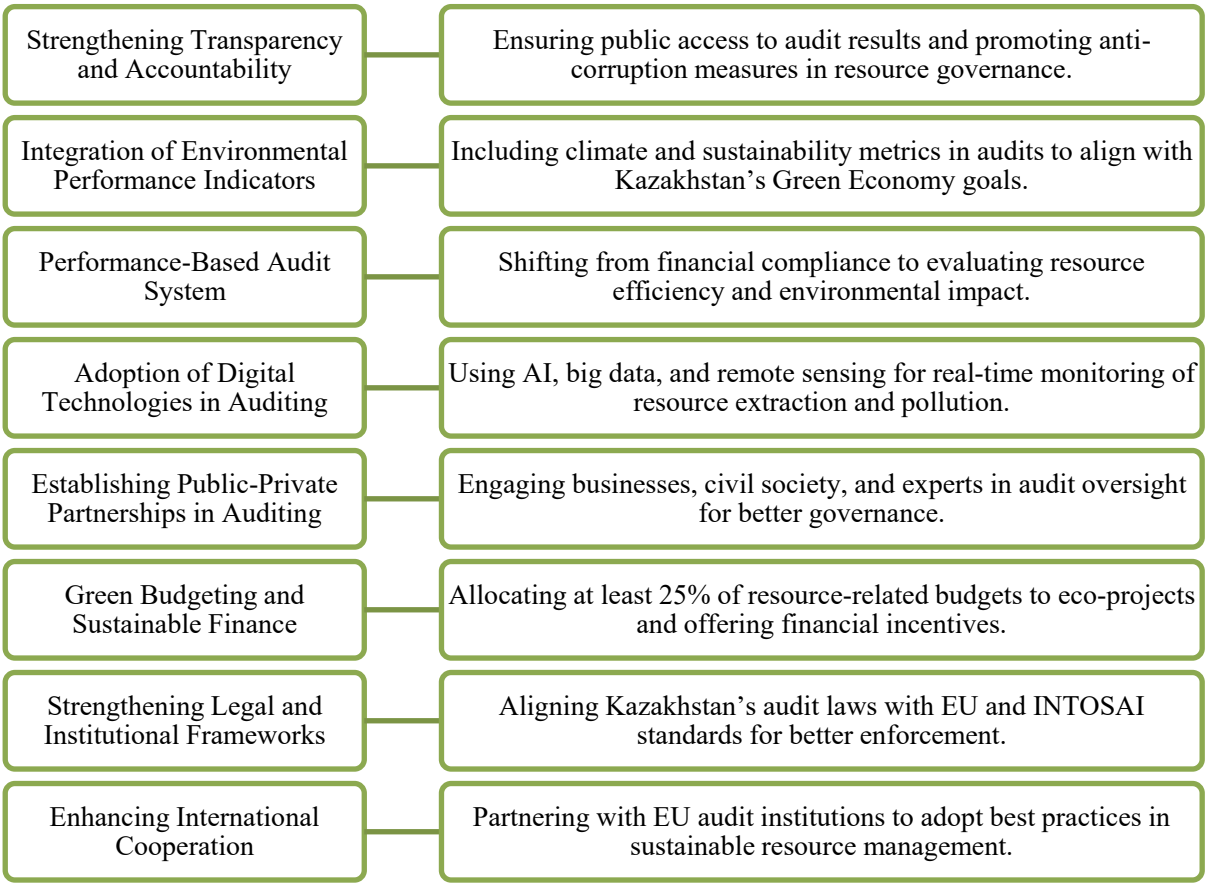

Figure 3 Enhancing State Audit for Natural Resource Governance: EU Insights for Kazakhstan

Note: compiled on the basis of data from [11]

Kazakhstan, as a resource-rich country, faces challenges in ensuring the sustainable and transparent management of its natural resources, particularly in the oil, gas, and mining sectors, which account for approximately 30% of GDP and over 60% of total exports. Despite the

presence of state audit institutions, such as the Accounts Committee for Control over Execution of the Republican Budget, there is a need for a more structured and performance-oriented audit mechanism. Drawing on the EU experience, Kazakhstan could integrate environmental performance indicators into its state audit framework, ensuring that budget allocations for resource extraction and environmental protection align with sustainability objectives. Additionally, the implementation of a biannual strategic evaluation model, similar to the CAP framework, could enhance policy adjustments and accountability. Another critical adaptation would be the introduction of eco-schemes, where at least 25% of resource-related budget allocations are directed toward sustainability initiatives, such as green energy transition and land restoration. Finally, Kazakhstan could strengthen its stakeholder engagement mechanisms in audit processes, ensuring broader participation of civil society and independent experts in resource governance assessments. By incorporating these EU-inspired audit mechanisms, Kazakhstan can significantly improve its regulatory effectiveness, enhance compliance with environmental commitments, and foster long-term economic stability.

Conclusion

Enhancing state audit mechanisms for natural resource governance is essential for ensuring transparency, efficiency, and sustainability, particularly in resource-rich economies like Kazakhstan. The European Union's experience demonstrates the effectiveness of performance-based auditing, environmental indicators, and strategic evaluations in improving governance structures. The integration of biannual audit reviews, eco-schemes allocating at least 25% of resource-related budgets to sustainability projects, and digital monitoring tools such as AI and remote sensing has significantly strengthened the EU's resource management framework.

For Kazakhstan, adapting these EU best practices can lead to better regulatory oversight, reduced financial mismanagement, and increased compliance with environmental sustainability goals. Strengthening stakeholder engagement, aligning with international audit standards (INTOSAI, EU regulations), and implementing green budgeting strategies will enhance long-term economic resilience and environmental accountability. By modernizing its state audit mechanisms, Kazakhstan can improve resource efficiency, attract sustainable investments, and ensure a more balanced economic structure, fostering sustainable growth and global competitiveness.

There is no conflict of interest.

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Табиғи ресурстарды басқару және сапасын бағалауға арналған мемлекеттік аудит механизмдерін жетілдіру: Еуропалық Одақ тәжірибесі

Аннотация. Табиғи ресурстарды тиімді басқару – мемлекеттік реттеудің маңызды бағыттарының бірі, әсіресе экологиялық қауіптердің артуы жағдайында. Мемлекеттік аудит механизмдері табиғи ресурстарды пайдаланудың ашықтығы мен заңдылығын қамтамасыз етуде шешуші рөл атқарады. Бұл зерттеуде Еуропалық Одақтың (ЕО) табиғи ресурстарды басқару саласындағы мемлекеттік аудит тәжірибесі қарастырылып, оның Қазақстанда қолдану

мүмкіндіктері бағаланады. Зерттеудің басты мақсаты – ЕО-ның аудиттік стратегияларының тиімділігін талдау, соның ішінде Ортақ ауыл шаруашылығы саясаты (САР) шеңберіндегі мониторинг пен стратегиялық жоспарлау тетіктерін қарастыру. Зерттеу барысында сапалық және сандық әдістер қолданылды, соның ішінде халықаралық тәжірибелерді салыстырмалы талдау және реттеу тетіктерін бағалау әдістері пайдаланылды. Нәтижесінде Қазақстанға бейімдеуге болатын негізгі қағидалар анықталды: экологиялық көрсеткіштерді аудитке енгізу, екі деңгейлі стратегиялық есеп беру жүйесі, мемлекет пен жеке сектордың өзара іс-қимылын дамыту, сондай-ақ табиғи ресурстарды тұрақты басқаруға арналған қаржылық ынталандыру шараларын енгізу. Зерттеу нәтижелері Қазақстандағы мемлекеттік аудит жүйесін жетілдіруге, табиғатты қорғау саясатының тиімділігін арттыруға және елдің экономикалық тұрақтылығын қамтамасыз етуге бағытталған ұсыныстарды әзірлеуге негіз болады.

Түйін сөздер: мемлекеттік аудит, сапаны бағалау, табиғи ресурстарды басқару, халықаралық тәжірибе, тұрақтылық, экологиялық басқару, есептілік.

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Совершенствование механизмов государственного аудита для оценки качества и управления природными ресурсами: опыт Европейского Союза

Аннотация. Эффективное управление природными ресурсами является важнейшей задачей государственного регулирования, особенно в условиях нарастающих экологических вызовов. Государственные аудиторские механизмы играют ключевую роль в обеспечении прозрачности, законности и эффективности использования природных ресурсов. В данном исследовании рассматривается опыт Европейского Союза (ЕС) в области государственного аудита управления природными ресурсами и его возможное применение в Казахстане. Основной целью работы является анализ эффективности аудиторских стратегий ЕС, таких как мониторинг в рамках Общей сельскохозяйственной политики (САР) и механизмы стратегического планирования. Исследование сочетает качественные и количественные методы, включая сравнительный анализ международных практик и оценку регулирующих механизмов. В результате выявлены ключевые принципы, которые могут быть адаптированы для Казахстана: интеграция экологических показателей в аудит, двухуровневая система стратегической отчетности, развитие механизмов государственно-частного взаимодействия и внедрение финансовых стимулов для устойчивого управления ресурсами. Практическое значение исследования заключается в разработке рекомендаций по совершенствованию государственного аудита в Казахстане, что позволит повысить эффективность природоохранной политики, улучшить управление ресурсами и обеспечить долгосрочную экономическую устойчивость страны.

Ключевые слова: государственный аудит, оценка качества, управление природными ресурсами, международный опыт, устойчивость, экологическое управление, подотчетность.

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