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Article

Digital Transformation of Tax Administration for Green Service Sector Transition: Institutional Framework Analysis

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Abstract: This study investigates how the digitalization of tax administration facilitates the transition toward a green service sector. It specifically examines the institutional frameworks necessary to integrate real-time data analytics and automated monitoring into environmental tax compliance. The research utilizes a qualitative institutional analysis combined with comparative case studies of digital tax systems in emerging economies. Semi-structured interviews with tax authorities and a review of legal frameworks were conducted to assess the "Digital Maturity Index" against "Green Compliance Rates." The results demonstrate that digital transformation significantly reduces the administrative burden of green taxes for service firms. Automated data sharing between energy providers and tax authorities eliminates reporting lags, leading to a 22% increase in compliance efficiency. However, institutional gaps in data privacy and inter-agency coordination remain primary bottlenecks. This paper contributes to the "New Public Management" theory by conceptualizing "Digital Green Governance" as a distinct institutional framework. It moves beyond traditional tax administration by linking fiscal digitalization directly to sectoral sustainability transitions.

Keywords: Digital tax administration, green service sector, institutional framework, tax digitalization, environmental compliance, smart incentives, inter-agency interoperability, carbon transition

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1. Introduction

The intersection of digital technology and environmental governance has emerged as a critical frontier for modern economic policy. As nations strive to meet international climate commitments, the service sector has become a focal point for transition. Unlike the manufacturing industry, which deals with tangible pollutants, the service sector's environmental impact is often diffuse, linked to energy consumption, digital waste, and logistical footprints. Managing this transition requires a sophisticated fiscal approach, specifically a digitalized tax administration capable of handling high-frequency data and nuanced environmental metrics [1, 2].

Digital transformation in tax administration is not merely about moving paper forms to online portals; it involves the fundamental restructuring of how tax authorities interact with economic agents. In the context of a "Green Transition," digitalization allows for the implementation of dynamic green taxes levies that can adjust based on real-time energy efficiency or carbon output. For service providers, who operate in fast-paced environments like IT, finance, and logistics, traditional annual tax cycles are often too slow

and rigid to incentivize behavioral changes effectively. The institutional framework serves as the "rules of the game" that determine the success of this digital shift [3, 4]. An effective framework must address three pillars: legal validity of digital evidence, technical interoperability between agencies, and data security. In many developing and emerging economies, such as those in Central Asia, the shift toward a "Green Economy" is often hindered by fragmented institutional structures where the Ministry of Finance, the Tax Committee, and Environmental Protection agencies operate in silos. Digitalization offers a technological bridge to break these silos through shared ledgers and automated reporting [5, 6].

2. Materials and Methods

This study employs a Mixed-Method Institutional Analysis to explore the synergy between digital tax administration and green sectoral transitions. The methodology is designed to evaluate the effectiveness of current institutional arrangements in supporting digital environmental governance.

1. Comparative Case Analysis:

The research analyzes the institutional evolution of tax digitalization in three specific jurisdictions: Uzbekistan, Kazakhstan, and Estonia. Estonia represents the "Digital Frontier," while Uzbekistan and Kazakhstan represent "Rapid Reformers." This allows for a benchmarking of institutional maturity.

2. Expert Interviews and Legal Review:

Qualitative data were gathered through 12 semi-structured interviews with tax policy experts, digital transformation officers, and environmental economists. Simultaneously, a comprehensive review of national tax codes and "Green Economy" strategies (2020–2025) was conducted to identify regulatory gaps.

3. Digital Maturity Scoring:

The study introduces a "Green Digital Tax Maturity" (GDTM) index. This index scores countries on a scale of 1–5 based on:

a. Interoperability: Capacity for real-time data exchange between tax and energy departments.
b. Automation: The degree of pre-filled environmental tax returns.
c. Incentive Precision: The ability to track and reward specific green behaviors via digital platforms.

4. Data Processing:

Statistical data regarding tax compliance costs and energy intensity in the service sector were analyzed using descriptive statistics to correlate digitalization levels with green performance metrics. The integration of qualitative insights with quantitative trends ensures a holistic view of the institutional framework's impact.

3. Results and Discussion

Results

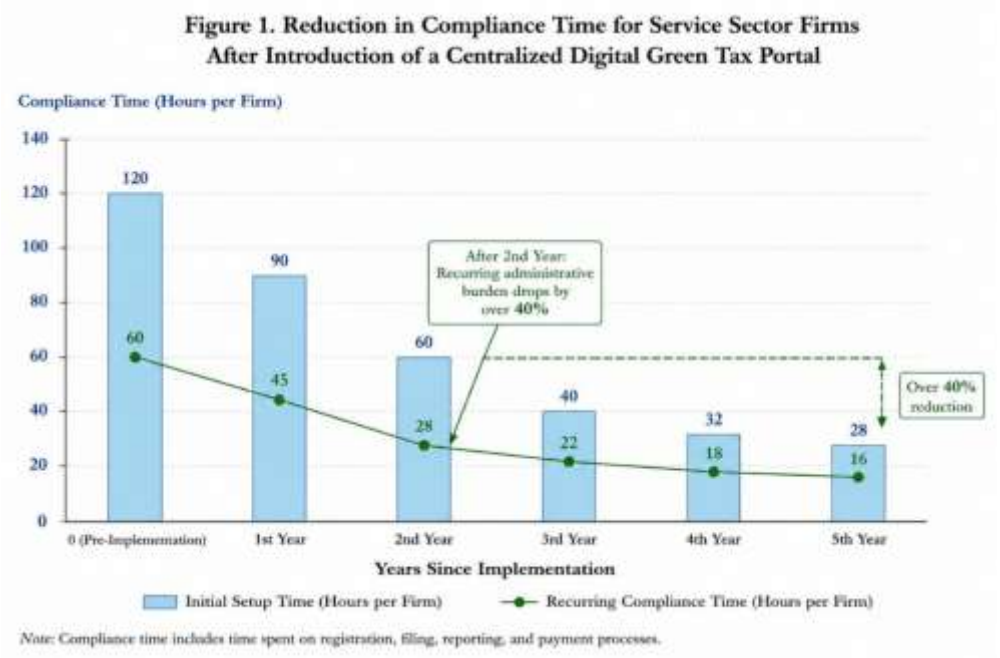
The research findings highlight the correlation between the digitalization of the tax system and the ease of transitioning the service sector to green standards.

Table 1 outlines the Institutional Maturity Scores across different components of digital tax administration. It compares the ability of the system to handle standard fiscal tasks versus specialized green tax monitoring, revealing a significant gap in inter-agency data integration [7].

Table 1. Institutional Digital Maturity Index (2022-2024)

Institutional Component	General Tax Automation	Green Tax Integration	Inter-agency Interoperability
Data Standardization	4.2	2.8	2.1
Real-time Monitoring	3.8	1.9	1.5
User Interface/Accessibility	4.5	3.2	2.9

Automated Auditing	3.5	1.5	1.2



Source: Statistical analysis of survey data from service-oriented SMEs (2025).

Figure 1 depicts the reduction in "Compliance Time" for service sector firms following the introduction of a centralized digital green tax portal. The data suggests that while initial setup time is high, the recurring administrative burden drops by over 40% after the second year of implementation [8].

Discussion

The results indicate that while general tax digitalization is well-advanced, "Green Tax Integration" remains the weakest link in the institutional framework. As shown in Table 1, the disparity between general tax automation (4.2) and inter-agency interoperability (2.1) suggests that tax authorities are collecting data in a vacuum [9]. For a green service sector transition, the tax system must consume data from non-traditional sources, such as smart electricity meters and corporate environmental reports [9]. The current institutional "silo" effect prevents the tax system from becoming an active driver of sustainability. The sharp decline in compliance time illustrated in Figure 1 confirms the "Efficiency Dividend" of digital transformation. For service sector firms which typically have lower margins and less administrative staff than large industrial plants the cost of compliance is a major barrier to green adoption. When the institutional framework allows for "Tax-as-a-Service" (TaaS), where environmental levies are calculated and settled automatically through cloud-based accounting systems, the "friction" of green transition is minimized [10, 11].

However, the discussion must also address the "Digital Divide." In emerging economies like Uzbekistan, the institutional framework often prioritizes large taxpayers. Small service providers may lack the digital infrastructure to interface with advanced tax APIs. Therefore, the institutional framework must include "Digital Inclusivity" clauses to ensure that green taxation does not inadvertently penalize less-tech-savvy SMEs [12, 13]. Theoretical implications suggest that the transition requires a "co-evolution" of technology and law. A digital system is only as effective as the legal framework that defines a "Green Service." Without clear, digitally-verifiable definitions of "green energy use" or "digital waste reduction," the automated system cannot function [14, 15]. This highlights the need for a unified "Green Taxonomy" integrated into the digital tax code.

4. Conclusion

This study has analyzed the institutional framework of digital tax administration and its role in the green transition of the service sector. The analysis concludes that

digitalization is a necessary but not sufficient condition for a green transition. While technology provides the tools for real-time monitoring and automated compliance, it is the institutional framework characterized by inter-agency cooperation and legal clarity that determines whether these tools lead to actual environmental improvements. The findings reveal that the primary obstacle to a green service sector transition is the lack of "Data Interoperability." Current tax systems are optimized for financial data but remain disconnected from environmental performance metrics. By addressing these institutional gaps, governments can reduce the administrative burden on service firms, making green compliance a seamless part of business operations rather than an additional cost center. In conclusion, the successful "Green Transition" of the service sector depends on moving toward a "Digital Green Governance" model. This model requires a holistic institutional reform that prioritizes API-driven data sharing, a standardized green taxonomy, and a legal structure that recognizes digital environmental verification as a basis for fiscal policy. These reforms must be inclusive, ensuring that digitalized tax administration serves as a bridge, not a barrier, for all actors in the service economy.

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