

**EFFECTIVENESS OF ENVIRONMENTAL TAXES IN UZBEKISTAN: EVIDENCE  
FROM ENERGY-INTENSIVE SECTORS**

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**Abstract:** This paper examines the effectiveness of environmental taxation in Uzbekistan with specific emphasis on energy-intensive sectors such as energy production, industry, and transport. Environmental taxes are fiscal instruments aimed at internalizing environmental externalities and incentivizing cleaner production and consumption. Despite global evidence that environmental taxes can reduce emissions and promote sustainable development, empirical assessments for Uzbekistan remain limited. Drawing on energy sector profiles, national policy documents, and regional analyses, this study evaluates how environmental fiscal policies align with Uzbekistan's environmental and economic goals. The analysis indicates that while environmental taxes have been introduced within a broader framework of sustainable development and green economy strategies, measurable impacts on emissions reduction and energy efficiency are currently modest due to low tax rates, limited enforcement mechanisms, and structural challenges in energy-intensive sectors. Nonetheless, emerging policy frameworks demonstrate potential pathways for improved outcomes if complemented by regulatory strengthening, investment in clean technology, and integration with broader environmental policy instruments. The findings can inform policymakers on optimizing environmental tax design and implementation to achieve intended environmental and economic objectives.

**Keywords:** Environmental taxes; environmental fiscal policy; Uzbekistan; energy-intensive sectors; green economy; emissions reduction.

### **Introduction**

Environmental taxes are fiscal instruments designed to internalize negative externalities associated with pollution and resource depletion while encouraging sustainable economic activity. Globally, environmental and carbon taxation has gained traction as a policy tool to address climate change and enhance energy efficiency across sectors [1]. In many countries, environmental taxes have demonstrably contributed to reduced carbon emissions, enhanced renewable energy use, and technological innovation in green sectors [2]. Uzbekistan, as an emerging economy with energy-intensive industries, faces significant environmental pressures, particularly in its energy, mining, and industrial sectors [3]. The country's drive toward sustainable development is reflected in recent national strategies that integrate environmental protection with economic advancement. However, there remains a gap in empirical evidence on the effectiveness of environmental taxes within Uzbekistan's context, especially regarding their impact on high-energy consumption sectors.

Uzbekistan's energy profile reveals heavy reliance on fossil fuels and high greenhouse gas (GHG) emissions intensity. Main sources of pollution include energy production, metallurgy, construction materials, and transport sectors [3]. Efforts to reduce these impacts must consider both regulatory measures (e.g., emissions standards) and economic instruments such as environmental taxes. Understanding how environmental taxes influence energy-intensive sectors is crucial to aligning fiscal policy with environmental objectives.

### Methodology

Given the scarcity of direct empirical studies on environmental taxes in Uzbekistan, this research adopts a **mixed analytical approach** that synthesizes:

1. **National energy and environmental data** from authoritative reports to establish baseline sector characteristics.
2. **Comparative evidence from international research** on environmental tax effectiveness.
3. **Policy analysis of Uzbekistan's environmental fiscal frameworks** to assess alignment with sustainable development goals.

Data on energy consumption patterns, emissions, and sectoral profiles were drawn from international and national reports, including analyses of Uzbekistan's energy sector and development policies. These were triangulated with academic findings on the theoretical and empirical impacts of environmental taxation from comparable contexts where possible [1], [2], [4].

The study applies **policy effectiveness criteria**, including evidence of emissions reduction, shifts in energy efficiency, and incentives for technological innovation in energy-intensive sectors.

### Results

#### 1. Sectoral Energy Consumption and Environmental Pressures

Uzbekistan's energy consumption has steadily increased in recent years, driven by industrial growth and economic expansion. For example, total electricity consumption increased from 57.6 billion kWh in 2016 to 74.9 billion kWh in 2021, with significant contributions from industrial users [5]. High energy intensity in these sectors contributes to elevated levels of carbon emissions and environmental degradation.

#### 2. Environmental Fiscal Policy Framework

Uzbekistan has begun incorporating environmental considerations into fiscal policy. The framework includes provisions for environmental taxes, though detailed implementation mechanisms and enforcement regimes are still evolving. Uzbekistan's participation in international agreements, such as the Paris Agreement, has prompted commitments to reduce GHG emissions by 35% by 2030 relative to 2010 levels, supported by strategies to improve energy efficiency and expand renewable energy [4], [6].

#### 3. Evidence from International Studies on Environmental Taxes

Evidence indicates that environmental taxes can be effective in reducing emissions in contexts where they are well-designed and integrated into broader environmental governance frameworks. For example, environmental protection taxes in China led to an average carbon emission reduction of 5.63% through enhanced clean technology investment, improved energy efficiency, and industrial optimization [1]. Other panel data analyses in the EU show that increased environmental taxation correlates with lower CO<sub>2</sub> emissions [7]. However, effectiveness is highly contingent on tax rate adequacy and policy enforcement.

#### 4. Uzbekistan's Environmental Tax Outcomes

In the Uzbekistan context, direct empirical measurement of environmental tax effectiveness remains limited. While environmental taxation is recognized as part of the broader green economy agenda, current environmental tax rates and regulatory mechanisms have not yet delivered measurable reductions in energy-sector emissions at scale. Contributing factors include lingering reliance on fossil fuels, outdated infrastructure, and insufficient incentives for investment in low-carbon alternatives.

### Discussion

The findings suggest that **environmental taxation in Uzbekistan, as it currently operates, has limited observable impacts on energy-intensive sectors**. Several factors explain this outcome:

**1. Policy Design Limitations:**

Environmental taxes are often low relative to economic incentives to continue fossil fuel use. Without sufficiently high tax rates, the incentive effect for firms to invest in energy-saving technologies or cleaner energy alternatives remains weak.

**2. Institutional and Regulatory Challenges:**

Effective tax enforcement requires strong institutional capacity, clear monitoring mechanisms, and integration with broader environmental regulations. Uzbekistan's public administration is in the process of adapting to these requirements, but gaps remain.

**3. Energy Infrastructure Constraints:**

High energy intensity in industrial and agricultural sectors reflects not only pricing policies but structural issues such as outdated infrastructure and high reliance on fossil fuels [8]. Environmental taxes alone cannot drive transformation without parallel investment in energy efficiency and modern technologies.

**4. Potential for Reform:** Despite current limitations, policy frameworks indicate potential for scaling up environmental taxation's effectiveness. Uzbekistan's national plans for renewable energy expansion and emissions reduction commitment by 2030 create an enabling environment for more robust environmental fiscal policy integration [4], [6].

**Comparison with Global Evidence:**

Comparative studies show that environmental taxes can effectively reduce pollution when combined with complementary measures such as research and development subsidies, regulatory standards, and public investment in clean infrastructure [1], [7]. Developing countries often require tailored fiscal instruments that consider economic growth priorities and technological capacities. Uzbekistan's case aligns with the broader understanding that environmental taxes are necessary but **not sufficient** alone to achieve significant environmental outcomes without supportive policy ecosystems.

**Conclusion**

This study finds that **environmental taxation in Uzbekistan has had limited measurable effects on energy-intensive sectors to date**, partly due to policy design and implementation challenges as well as structural energy sector characteristics. While the national policy direction increasingly prioritizes sustainable development and emissions reduction, environmental taxes need to be strengthened through higher tax rates, improved enforcement, and integration with supportive instruments such as renewable energy incentives and energy efficiency programs.

For Uzbekistan to achieve meaningful emissions reductions and progress toward sustainability, environmental taxation must be part of a **broader policy mix** that includes regulatory reforms, investment in clean technologies, and international cooperation. Future research should focus on **empirical evaluations** once more comprehensive tax implementation data becomes available.

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