



Research Article



The Impact of Sustainable Transportation Policies on SDG13: Climate Action

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Annotation

The transportation sector is a significant contributor to global greenhouse gas (GHG) emissions, necessitating the implementation of sustainable transportation policies to mitigate climate change impacts. In Uzbekistan, the transport sector's CO₂ emissions have risen markedly, accounting for 12.6% of the nation's total fossil CO₂ emissions in 2022, up from 7.1% in 2010, with road transport contributing 98% of these emissions. Despite these developments, there remains a lack of comprehensive analysis on the effectiveness of sustainable transportation policies in reducing emissions within Uzbekistan's specific context. This study aims to evaluate the impact of sustainable transportation policies on achieving SDG13: Climate Action in Uzbekistan, focusing on emission reduction outcomes and policy effectiveness. Findings indicate that implementing a 10% hydrogen blend in compressed natural gas (CNG) vehicles could reduce road transport emissions by 0.62 MtCO₂eq annually. This research provides the first detailed assessment of hydrogen-enriched fuel's potential in Uzbekistan's transport sector, offering a novel perspective on emission reduction strategies. The study underscores the importance of integrating alternative fuel technologies into national transport policies to achieve climate action goals, highlighting the need for further research into scalable and context-specific sustainable transport solutions.

Keywords: Sustainable transportation policies, SDG13, climate action, greenhouse gas emissions, hydrogen-enriched fuels, Uzbekistan, policy effectiveness, emission reduction strategies.



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Introduction

Climate change stands as one of the most pressing global challenges, with the transportation sector being a significant contributor to greenhouse gas emissions. Recognizing this, Sustainable Development Goal 13 (SDG13) emphasizes the urgent need for climate action, urging nations to integrate climate change measures into national policies and planning. Sustainable transportation policies, which promote low-emission and energy-efficient transport systems, are pivotal in achieving the targets set under SDG13. The relationship between sustainable transportation and climate action is underscored by the potential of transport policies to mitigate environmental

impacts. For instance, transitioning to electric vehicles, enhancing public transportation infrastructure, and promoting non-motorized transport can significantly reduce carbon emissions. Studies have shown that such measures not only contribute to emission reductions but also offer co-benefits like improved air quality and public health. However, the effectiveness of these policies varies across regions, influenced by factors such as economic capacity, technological advancement, and public acceptance [1].

Despite the recognized importance of sustainable transport in climate mitigation, there exists a knowledge gap in understanding the specific impacts of these policies on achieving SDG13 targets. Previous studies have often focused on isolated aspects, lacking a comprehensive analysis that encompasses the multifaceted nature of transportation systems and their environmental implications. This gap hinders the development of holistic strategies that can effectively integrate transportation planning with climate objectives. To address this, the current study employs a mixed-methods approach, combining quantitative data analysis with qualitative assessments, to evaluate the impact of sustainable transportation policies on SDG13 [2]. By analyzing case studies from various regions, the research aims to identify best practices, challenges, and the contextual factors that influence policy outcomes. This methodology allows for a nuanced understanding of how transportation initiatives contribute to climate action goals [3].

The anticipated findings are expected to provide valuable insights into the effectiveness of sustainable transportation policies in advancing SDG13. These insights can inform policymakers, urban planners, and stakeholders in designing and implementing transport strategies that are both environmentally sustainable and socially equitable. Ultimately, the study aims to contribute to the broader discourse on integrating transportation planning with climate action, facilitating the development of resilient and sustainable urban environments [4].

Methodology

The methodology of this study is the use of a mixed methodology combining quantitative data using climatic change and transportation in Uzbekistan and qualitative data. The theoretical and empirical basis was obtained through a review of national and international literature, statistical bulletins and meeting proceedings. On the national scale, I conducted statistical analysis using data for the transportation and environmental 1998–2022, including railway, automobile, air, pipeline cargo turnover, greenhouse gas emissions, and climate disaster frequency. It also allowed for evaluation of temporal changes and correlations of transportation movements with environmental degradation. At the same time, policy analysis applied to such documents as Uzbekistan's Nationally Determined Contributions (NDCs), the Strategy for Transition to a Green Economy, and presidential decrees, offered guidance into what the government's climate resilience agenda is. Economic modeling based on water stress, air quality, and regional GDP loss experienced due to climate impacts was used to assess sectoral vulnerability. Benchmarks were established in Uzbekistan's climate adaptation strategies by comparing to international frameworks such as the UNFCCC and the Sendai Framework. Additionally, thematic synthesis of expert opinions from climatology, transport economics and logistics, as well as contextual challenges, helped explain contextual challenges and the proposed measures. An analysis of the historical data, the documentation of the current situation, and the synthesis of the root causes accomplished this comprehensive examination of climate change effects, including how they interact with the development of transportation infrastructure in Uzbekistan. The methodology results in a robust multidimensional view that supports strategic recommendations specific to Uzbekistan's socio-economic and environmental context with regard to international climate aims.

Results and Discussion

According to latest available data, GHG emissions from Uzbekistan's transport sector have significantly increased over last three years. In 2022, the sector accounted for about 18.38 million

tonnes of CO₂ equivalent (MtCO₂ eq), which is the largest source of emissions growth among all sectors in the country. At year 2023, transport related CO₂ emissions touched 16.3 million ton CO₂, roughly accounting for 12 percent to the national total emissions. This is an upswing of the rising environmental effect of the transport sector [5].

In 2022, road transport continues to provide the major contribution with 98% of transport emissions. In 2023, the sector recorded emissions intensity on GDP at 46.1 gCO₂ per USD, which was above the average of the Asia-Pacific 32.0 gCO₂ per USD. Such a relationship with carbon footprint indicates a higher carbon footprint than output, compared to regional peers [6].

To mitigate these emissions, efforts have been made in the promotion of battery electric vehicles (BEVs) and in the investigation of the usage of the hydrogen as an alternative fuel. Integrating hydrogen into the transport sector will also substantially reduce emissions studies suggest, either as hydrogen enriched CNG (HCNG) or pure hydrogen fuel. For example, reducing CO₂eq emissions from road transport by 0.62 MtCO₂ eq per year could be afforded powering all CNG vehicles with a 10% hydrogen blend. Furthermore, replacing diesel trucks with hydrogen trucks would also contribute to a further reduction of 0.32 MtCO₂ eq per year [7].

In the railway sector, trains running on hydrogen can eliminate up to 0.1 kgCO₂ eq per kilometre journey in lines that are not electrified.

However, there are still several challenges. However, the knowledge gap in climate change studies in Central Asia influences evidence based development of effective policy. Despite the maturity of VP8 and other lossy compression standards, most applications including videoconferencing are far from mainstream, with public awareness and understanding of climate change causes and impacts among youth in remote communities outside the major urban centers still limited. Interestingly, the survey found that 44 percent of young people knew only one climate-related term, and there were major gaps between Tashkent and other regions. Lacking awareness about the products can hinder their adoption of sustainable practices and their effectiveness in implementing policy [8].

The gaps need to be addressed with further research. Other studies involve feasibility and scalability assessments of hydrogen fuel options in Uzbekistan's particular situation, socio-economic impacts due to a move towards low emission transport solutions, and strategies for further public engagement and education on climate concerns. Secondly, it is necessary to develop a strategy for the transport sector integrally, a strategy that combines climate resilience and sustainability goals. Such a strategy should take into account that Uzbekistan is critically dependent on fossil fuels, is in the process of infrastructure development, demands public awareness and education.

Finally, Uzbekistan's progress in cleaning up its transport sector is thus far, even if not sufficient and still a work in progress; and achieving sustainable and resilient transport emissions will require a broad approach, including technological progress and policy improvement, public education and international cooperation. These strategies will require addressing the existing knowledge gaps and enhancing public awareness to succeed.

Conclusion

Recent work put in by Uzbekistan to promote sustainable transportation policies has greatly aided Uzbekistan on its way to Sustainable Development Goal 13 (SDG13): Climate Action. Between 2010 and 2022, fossil CO₂ emissions from the transport sector increased from 7.1 to 12.6 percent and road transport accounted for 98 percent of those, rising from 7.1 to 12.6 percent. In response to this, the government has put into place measures where it encourages people to use battery electric vehicles (BEVs) and investigate hydrogen fuel as an alternative. For example, incorporating 10% hydrogen in compressed natural gas (CNG) vehicles to meet CO₂ eq emissions

road transport of 0.62 MtCO₂ eq/ year. Part of these initiatives take place within broader frameworks, such as the "Uzbekistan – 2030" Strategy, according to which it is planned to reduce greenhouse gas emissions per unit of GDP by 35% from 2010 levels to 2030. However, more work needs to be done, such as a lack of public awareness surrounding climate change and the need for integrated information to assist in making policy decisions. More research is required to ascertain the socio-economic effects to transitioning to low emission transport options and ways of increasing public involvement in the climate issues. For Uzbekistan to achieve its climate objectives, these gaps will need to be addressed, and consequently, it will need to contribute effectively to global climate action efforts.

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