

ENHANCING THE ORGANIZATIONAL AND ECONOMIC MECHANISMS FOR THE DEVELOPMENT OF GREEN TRANSPORT SERVICES: THE CASE OF BUKHARA REGION

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Abstract

The transition toward environmentally sustainable transport has become an important component of regional economic and urban development. Green transport combines environmental objectives with improvements in mobility, service quality, resource efficiency, and infrastructure. For Uzbekistan, this issue is increasingly relevant as transport demand and transport-service volumes continue to grow while the country seeks to reduce greenhouse-gas emissions and improve urban air quality. The Bukhara region provides a relevant case for examining these processes because its transport sector is expanding and the city of Bukhara is undergoing modernization of its public transport system. This article examines the organizational and economic mechanisms that can support the development of green transport services in Bukhara Region. It draws on academic literature concerning sustainable mobility and green logistics, official statistics of the National Statistics Committee of Uzbekistan, and reports by international organizations. Particular attention is given to public transport modernization, electric mobility, investment mechanisms, service organization, and institutional coordination. The analysis indicates that the development of green transport requires not only environmentally friendly vehicles but also appropriate infrastructure, financing mechanisms, transport planning, service-management systems, and cooperation between public authorities and private operators.

Keywords: green transport, transport services, sustainable mobility, electric transport, public transport, organizational mechanisms, economic mechanisms, Bukhara Region, Uzbekistan.

Annotatsiya

Ekologik barqaror transportga o'tish hududiy iqtisodiy va shahar rivojlanishining muhim tarkibiy qismiga aylangan. Yashil transport ekologik maqsadlarni harakatlanish imkoniyati, xizmat sifati, resurslardan samarali foydalanish va infratuzilmani yaxshilash bilan birlashtiradi. O'zbekiston uchun bu masala tobora dolzarblashib bormoqda: transportga talab va transport xizmatlari hajmi o'smoqda, mamlakat esa issiqxona gazlari chiqindilarini kamaytirish va shahar havosi sifatini yaxshilashga intilmoqda. Buxoro viloyati bu jarayonlarni o'rganish uchun mos misol bo'ldi, chunki uning transport sohasi kengaymoqda, Buxoro shahrida jamoat transporti tizimi modernizatsiya qilinmoqda. Maqolada Buxoro viloyatida yashil transport xizmatlarini rivojlantirishni qo'llab-quvvatlaydigan tashkiliy-iqtisodiy mexanizmlar o'rganildi. Tahlil barqaror harakatchanlik va yashil logistikaga oid ilmiy adabiyotlar, O'zbekiston Milliy statistika qo'mitasining rasmiy ma'lumotlari hamda xalqaro tashkilotlar hisobotlariga tayandi. Jamoat transportini modernizatsiya qilish, elektr transporti, investitsiya mexanizmlari, xizmatlarni tashkil etish va institutsional

muvofiglashtirishga alohida e'tibor qaratildi. Tahlil yashil transportni rivojlantirish uchun faqat ekologik toza transport vositalari yetarli emasligini, unga mos infratuzilma, moliyalashtirish mexanizmlari, transportni rejalashtirish, xizmatlarni boshqarish tizimlari va davlat organlari bilan xususiy operatorlar hamkorligi ham zarurligini ko'rsatdi.

Kalit so'zlar: yashil transport, transport xizmatlari, barqaror harakatchanlik, elektr transporti, jamoat transporti, tashkiliy mexanizmlar, iqtisodiy mexanizmlar, Buxoro viloyati, O'zbekiston.

Аннотация

Переход к экологически устойчивому транспорту стал важной составляющей регионального экономического и городского развития. Зеленый транспорт объединяет экологические цели с повышением мобильности, качества услуг, эффективности использования ресурсов и развитием инфраструктуры. Для Узбекистана этот вопрос становится все более актуальным: спрос на транспорт и объем транспортных услуг продолжают расти, а страна стремится сократить выбросы парниковых газов и улучшить качество воздуха в городах. Бухарская область стала показательным примером для изучения этих процессов, поскольку ее транспортный сектор расширяется, а в городе Бухаре проводится модернизация системы общественного транспорта. В статье рассмотрены организационно-экономические механизмы, способные поддержать развитие зеленых транспортных услуг в Бухарской области. Анализ опирался на научную литературу по устойчивой мобильности и зеленой логистике, официальные данные Национального комитета статистики Узбекистана и отчеты международных организаций. Особое внимание уделено модернизации общественного транспорта, электромобильности, инвестиционным механизмам, организации услуг и институциональной координации. Анализ показал, что развитие зеленого транспорта требует не только экологически чистых транспортных средств, но и соответствующей инфраструктуры, механизмов финансирования, транспортного планирования, систем управления услугами и сотрудничества органов власти с частными операторами.

Ключевые слова: зеленый транспорт, транспортные услуги, устойчивая мобильность, электрический транспорт, общественный транспорт, организационные механизмы, экономические механизмы, Бухарская область, Узбекистан.

INTRODUCTION

Transport plays an important role in regional economic development because it connects people, businesses, markets, and public services. At the same time, transport activities are associated with environmental pressures, including greenhouse-gas emissions and air pollution. Consequently, the modernization of transport systems increasingly involves not only improving mobility but also reducing the environmental impact of transportation.

The concept of sustainable mobility represents a broader approach than conventional transport planning. David Banister argues that sustainable mobility

requires a shift away from a narrow focus on travel speed and cost toward a combination of technological improvements, changes in transport modes, land-use planning, and measures that can make sustainable forms of mobility more acceptable to users [1]. Green logistics research similarly emphasizes the integration of environmental considerations into transport and logistics decisions. Rommert Dekker, Jacqueline Bloemhof, and Ioannis Mallidis describe green logistics as involving the integration of environmental aspects into logistics and identify opportunities for incorporating environmental considerations into the design, planning, and control of transport and supply chains [2].

This international discussion is particularly relevant to Uzbekistan. The World Bank's Uzbekistan Country Climate and Development Report identifies improved urban mobility and efficient public transport as important areas for reducing greenhouse-gas emissions, congestion, and climate-related risks [12]. The report also notes that significant investment will be required for Uzbekistan's broader decarbonization agenda [12]. The issue is becoming increasingly relevant at the regional level. According to Uzbekistan's National Statistics Committee, the volume of transport services in Bukhara Region increased from 5.868 trillion soums in 2024 to 7.6616 trillion soums in 2025, based on preliminary 2025 data [10]. Therefore, the development of green transport services should be considered not simply as an environmental objective but also as a component of the modernization of the regional service economy.

LITERATURE REVIEW

Green transport can be understood as a transport system designed to reduce negative environmental effects while maintaining or improving mobility and service efficiency. The sustainable-mobility approach developed by Banister provides an important theoretical foundation [1]. Rather than treating transport primarily as a question of increasing speed and reducing travel costs, the sustainable mobility paradigm considers technological change, modal choice, accessibility, land-use planning, and public participation as interconnected elements of transport policy. This approach is important because replacing conventional vehicles with cleaner vehicles alone does not constitute a complete transport transformation. A green transport system also requires appropriate organization of routes, infrastructure, financing, information systems, and user-oriented services [8].

Electric buses represent one technological component of this transformation. Moataz Mahmoud et al., in their review of electric-bus powertrains, identify electric buses as an important option for reducing the environmental impacts associated with fossil-fuel-based public transport, while also noting that different electric powertrain technologies involve different operational considerations [7]. More recent research also demonstrates that the environmental and economic performance of alternative public-transport technologies depends on local conditions. Factors such as electricity sources, vehicle utilization, charging strategies, operating cycles, and infrastructure can affect the overall results of fleet electrification [6].

Thus, the organizational-economic mechanism for green transport should be understood as a combination of institutional organization, transport planning, infrastructure development, investment and financing, pricing and incentive mechanisms, environmentally efficient technologies, digital management, and monitoring and evaluation [4]; [5].

METHODOLOGY

This study utilizes a qualitative and analytical approach based on a comprehensive review of academic literature, official institutional reports, and empirical statistical data from the National Statistics Committee of the Republic of Uzbekistan (SIAT) [9; 10]. The methodology integrates descriptive analysis of transport-service market volumes, road passenger transportation indicators, and electric vehicle registration metrics alongside evaluation of strategic policy frameworks published by organizations such as the World Bank and the United Nations Development Programme (UNDP) [11]; [12]; [13]. By synthesizing secondary statistical datasets with established theoretical paradigms of green logistics and sustainable urban mobility, the research evaluates the structural development and institutional needs of Bukhara Region's transport sector.

ANALYSIS AND RESULTS

Bukhara Region has experienced considerable growth in transport services during the last decade. Official data from the National Statistics Committee show that the volume of transport services in Bukhara Region increased from 391.4 billion soums in 2010 to 5.868 trillion soums in 2024, reaching a preliminary 7.6616 trillion soums in 2025 [10]. This represents a substantial expansion of the transport-service market. However, growth in the monetary volume of transport services does not automatically indicate environmental sustainability. Therefore, the next stage of regional transport development requires attention to the environmental characteristics and organizational efficiency of the services being provided. Passenger transportation is also significant. National Statistics Committee data show that road passenger transportation in Bukhara Region reached 161.7 million passengers in the first two quarters of 2026, compared with 141.3 million in the corresponding period of 2025 [10]. The same statistical source reports a 4.9% year-on-year growth rate for road passenger transportation in Bukhara Region in both the first and second quarters of 2026 [10]. These figures indicate continuing demand for road-based mobility, meaning that improving the environmental performance of public and commercial transport can potentially have a meaningful regional effect.

Recent developments in Bukhara demonstrate that transport modernization is already taking place. In February 2026, 25 new modern buses were delivered to Bukhara, introduced on routes 13 and 15 in accordance with the city's General Transport Plan and tender results, raising the number of routes operating under the gross-contract system to nine with a total rolling stock of 109 units [14]. In April 2026, another 24 modern buses were delivered to Bukhara for use on new public transport routes under the gross-contract system, with stated objectives including improving public transport infrastructure, reducing traffic congestion, and improving

environmental safety [15]. The gross-contract approach is important from an organizational perspective because it changes the relationship between transport authorities and service operators by organizing services around specified routes, service requirements, and contractual obligations rather than traditional arrangements. However, the introduction of modern buses should be accompanied by broader improvements in route planning, passenger information, service frequency, vehicle utilization, maintenance, and infrastructure.

Electric mobility is also becoming increasingly important in Uzbekistan. According to the National Statistics Committee, 109,200 electric vehicles were registered in Uzbekistan as of April 1, 2026, with Bukhara Region accounting for 1,685 registered electric vehicles [9]. The growth of electric mobility creates opportunities for the development of new transport services, including electric taxis, electric buses, charging infrastructure, and associated maintenance services. The Uzbek government has introduced measures intended to encourage electric taxi services, such as a reduction of up to 10% in social tax and limited free parking at state-organized parking facilities for taxi drivers using electric vehicles beginning in March 2026 [3]. These measures illustrate one type of economic mechanism: financial and regulatory incentives can be used to influence the behavior of transport-service providers. At the same time, incentives alone are insufficient, as electric mobility requires charging infrastructure, appropriate electricity connections, maintenance capacity, trained personnel, and effective route and fleet management.

The organizational mechanism can be understood as the institutional structure through which green transport services are planned, coordinated, operated, and monitored. For Bukhara Region, several organizational components are particularly relevant, including integrated transport planning that connects transport development with urban development and land-use planning. Coordination between public authorities and operators via the gross-contract system establishes measurable service requirements such as route coverage, frequency, punctuality, vehicle condition, passenger safety, accessibility, and environmental performance [13]. Digital management systems can support route optimization, fleet monitoring, electronic ticketing, passenger information, and operational data collection. Furthermore, guidelines such as those published by UNDP and Uzbekistan's Ministry of Transport in November 2025 address procurement, operation, maintenance, emissions reduction, urban air quality, and operational efficiency for electric bus fleets [11].

The economic mechanism concerns how resources are mobilized and how financial incentives influence transport-service providers and users. One of the major challenges is the initial investment required for cleaner technologies, as electric vehicles and associated infrastructure can require substantial upfront expenditure. The World Bank's analysis of Uzbekistan emphasizes that the scale of investment required for decarbonization means that private investment can play an important role alongside public financing, specifically identifying the need for an environment capable of attracting local and foreign investment [12]. Several economic instruments can therefore be considered in the regional transport sector, including public investment,

public-private partnerships, targeted incentives, performance-based contracts, infrastructure financing, and environmental criteria in procurement. These mechanisms should be evaluated according to their actual economic and environmental results rather than assumed to be effective automatically.

In summary, the available evidence shows several important opportunities for Bukhara Region, including expanding transport services, growing passenger demand, active public transport modernization, and a supportive national policy framework for electric mobility. However, several challenges must be considered, including infrastructure constraints, financing gaps for capital-intensive fleet transitions, institutional coordination among multiple actors, and the need for reliable evaluation where environmental performance depends on energy sources, vehicle lifecycle, and operating conditions rather than alternative powertrains alone. To address these challenges, the organizational-economic mechanism for Bukhara can be structured across five interconnected areas: transport organization via integrated route and fleet planning, technology through the gradual introduction of low-emission vehicles, infrastructure for charging and maintenance, finance via public-private investment and contractual models, and management through digital monitoring and performance indicators.

CONCLUSION AND SUGGESTIONS

The development of green transport services is becoming increasingly relevant to the modernization of regional economies. International research on sustainable mobility and green logistics demonstrates that environmental objectives need to be integrated with transport planning, technology, service organization, and economic decision-making. The case of Bukhara Region demonstrates that transport services are expanding and that public transport modernization is already underway. Official statistics show substantial growth in the regional transport-services market, while recent modernization programs have introduced new buses and expanded the gross-contract system. At the national level, Uzbekistan is also experiencing growth in electric mobility and has introduced measures intended to encourage electric transport services.

The evidence suggests that the further development of green transport in Bukhara should not be limited to the introduction of environmentally friendly vehicles. It should involve coordinated transport planning, appropriate infrastructure, financing mechanisms, cooperation between public and private actors, digital management, and measurable service and environmental indicators. The central organizational-economic challenge is therefore to connect environmental sustainability with economic efficiency and quality of transport services. Such an integrated approach can provide a stronger basis for the long-term modernization of transport services in Bukhara Region.

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