

УДК 336.27:330.34(479.24)

JEL Classification H63, O11

DOI [https://doi.org/10.33146/2307-9878-2025-2\(108\)-190-200](https://doi.org/10.33146/2307-9878-2025-2(108)-190-200)

## Public Debt as a Catalyst for Infrastructure Development in Key Sectors of the Economy: Case Study of Azerbaijan

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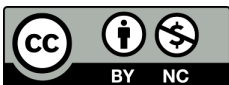
**Abstract.** *In the context of Azerbaijan's economic diversification away from oil dependency, the strategic use of public debt has become increasingly significant for financing infrastructure development. This study analyzed how Azerbaijan employs public borrowing to support key infrastructure projects contributing to sustainable economic growth and regional integration. A qualitative research approach was used, examining official reports, international development bank data, and policy documents related to infrastructure financing in Azerbaijan. The findings indicate that public debt is pivotal in funding major national infrastructure initiatives in transport, energy, water, and digital connectivity. Projects such as the expansion of the Baku Metro, highway modernization, renewable energy installations, and the development of the Caspian-Black Sea-Europe Energy Corridor illustrate how debt-financed investments are transforming Azerbaijan's physical and economic landscape. Furthermore, the research highlights Azerbaijan's collaboration with international financial institutions, including the European Bank for Reconstruction and Development, the Asian Development Bank, and the European Investment Bank, which enhances funding capacity and ensures alignment with global sustainability frameworks like the European Green Deal and the 29th Conference of the Parties to the United Nations Framework Convention on Climate Change goals. These efforts have reduced dependency on oil revenues, increased foreign direct investment, improved regional trade links, and strengthened institutional capacity for long-term debt management. Thus, the findings suggest that Azerbaijan's infrastructure development agenda is consciously aligned with broader national strategies that seek to reduce hydrocarbon dependency, expand non-oil sectors, and enhance resilience to economic and environmental shocks. Ultimately, this study's results help to better understand how strategic public debt utilization can accelerate sustainable infrastructure development in emerging economies.*

**Keywords:** *Azerbaijan, debt management, regional integration, renewable energy, economic diversification.*

**Received:** 21 May 2025 | **Revised:** 3 June 2025 | **Accepted:** 8 June 2025 | **Published:** 10 June 2025

### Suggested Citation

Rashidov, A. (2025). Public Debt as a Catalyst for Infrastructure Development in Key Sectors of the Economy: Case Study of Azerbaijan. *Oblik i finansi*, 2(108), 190-200. [https://doi.org/10.33146/2307-9878-2025-2\(108\)-190-200](https://doi.org/10.33146/2307-9878-2025-2(108)-190-200)



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# Державний борг як каталізатор розвитку інфраструктури в ключових секторах економіки: приклад Азербайджану

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**Анотація.** У контексті диверсифікації економіки Азербайджану, яка позбавляє його залежності від нафти, стратегічне використання державного боргу набуває дедалі більшого значення для фінансування розвитку інфраструктури. Мета цього дослідження – виявити, як Азербайджан використовує державні запозичення для підтримки ключових інфраструктурних проєктів, що сприяють сталому економічному зростанню та регіональній інтеграції. В дослідженні використано метод якісного аналізу даних із офіційних звітів та публікацій національних та міжнародних установ, що пов'язані з фінансуванням інфраструктури в Азербайджані. Результати дослідження свідчать, що державний борг є ключовим засобом фінансування національних інфраструктурних ініціатив у сфері транспорту, енергетики, водних ресурсів та цифрового зв'язку. Такі проєкти, як розширення Бакинського метрополітену, модернізація автомагістралей, установки відновлюваної енергії та розвиток Каспійсько-Чорноморсько-Балтійського енергетичного коридору, ілюструють, як інвестиції, що фінансуються за рахунок боргу, трансформують фізичний та економічний ландшафт Азербайджану. Крім того, дослідження висвітлює співпрацю Азербайджану з міжнародними фінансовими установами, включаючи Європейський банк реконструкції та розвитку, Азіатський банк розвитку та Європейський інвестиційний банк, що розширює можливості фінансування та забезпечує відповідність глобальним рамкам сталого розвитку, таким як Європейська зелена угода та цілі 29-ї Конференції сторін Рамкової конвенції ООН про зміну клімату. Ці зусилля зменшили залежність країни від доходів з продажу нафти, збільшили прямі іноземні інвестиції, покращили регіональні торговельні зв'язки та зміцнили інституційний потенціал для довгострокового управління боргом. Таким чином, результати дослідження свідчать про те, що порядок денний розвитку інфраструктури Азербайджану свідомо узгоджується з ширшими національними стратегіями, спрямованими на зменшення залежності від вуглеводнів, розширення нафтових секторів та підвищення стійкості до економічних та екологічних потрясінь. Зрештою, результати цього дослідження допомагають краще зрозуміти, як стратегічне використання державного боргу може пришвидшити сталий розвиток інфраструктури в країнах, що розвиваються.

**Ключові слова:** Азербайджан, управління боргом, регіональна інтеграція, відновлювана енергетика, диверсифікація економіки.

## INTRODUCTION

Public borrowing has long served as a critical mechanism for governments to finance infrastructure investments exceeding immediate fiscal capacity limits. It enables the realization of large-scale, capital-intensive projects – such as highways, energy grids, water systems, and digital connectivity – foundational to economic modernization and long-term productivity gains (Reinhart & Rogoff, 2010). In emerging and resource-dependent economies, where revenue streams may be volatile or constrained by narrow tax bases, debt instruments allow policymakers to bridge financing gaps and accelerate development objectives.

Azerbaijan, classified as a middle-income country with a historical dependence on hydrocarbon exports, exemplifies this dynamic. Following the oil price shocks of the mid-2010s and growing recognition of the need for economic diversification, the country has increasingly turned to public borrowing as a strategic tool for implementing its national development agenda. Since 2019, Azerbaijan has secured concessional and non-concessional loans, as well as technical support, from a range of multilateral development institutions – including the European Bank for Reconstruction and Development (EBRD, 2025) and the Asian Development Bank

(Egala et al., 2024; ADB, 2022). These resources have been directed toward priority sectors such as transportation infrastructure, renewable energy, water management, and digital transformation, aligning with the state's broader ambitions of transitioning to a more sustainable and innovation-driven economy.

While these borrowing activities are frequently presented in government strategy documents as aligned with national goals and global sustainability norms, there remains a striking lack of critical, qualitative analysis of how debt-financed infrastructure projects are conceptualized, implemented, and evaluated in Azerbaijan. In particular, there is little research assessing the alignment of these projects with internationally endorsed frameworks such as the European Green Deal (European Commission, 2019), the UN Sustainable Development Goals (SDGs), and the post-COP29 commitments adopted under the United Nations Framework Convention on Climate Change (UNFCCC, 2024). The absence of such analysis risks obscuring important questions about the social, environmental, and economic trade-offs embedded in infrastructure borrowing, and whether these projects effectively contribute to a sustainable and equitable development trajectory.

The present study undertakes a content analysis of various primary and secondary sources to address this empirical and analytical gap. These include government-issued infrastructure and debt management strategies, international lenders' project documentation and evaluation reports, and peer-reviewed academic studies published between 2019 and early 2025. The analytical framework integrates theoretical perspectives from the literature on public debt efficacy and macroeconomic risk (Reinhart & Rogoff, 2010; Herndon et al., 2014) and conceptual approaches drawn from sustainability transitions research (Markard et al., 2012). The author developed an iterative coding scheme to extract recurring patterns and discourses surrounding three core analytical dimensions: (1) the strategic objectives articulated for borrowing-led infrastructure development, (2) the thematic emphasis areas – including modernization, economic resilience, and environmental sustainability – and (3) the degree of substantive alignment between project designs, implementation modalities, and reporting mechanisms with global sustainability and climate frameworks.

By triangulating insights from policy documents, financial institution portfolios, and scholarly assessments, the study offers an understanding of how public debt functions as both a fiscal tool and a development narrative in Azerbaijan's contemporary infrastructure agenda. The findings shed light on the extent to which borrowing decisions are shaped by developmental ambition versus lender influence, and whether these investments genuinely facilitate a shift toward sustainability or reproduce older patterns of carbon-intensive growth. As such, the study contributes to broader debates on development economics, political economy, and environmental governance. It also holds practical relevance for policymakers and international financial institutions seeking to balance fiscal responsibility with developmental urgency in middle-income contexts undergoing structural transition.

## LITERATURE REVIEW

In recent years, assessing the effects of debt-financed public investments, especially in infrastructure sectors such as transport, energy, and utilities, has been the subject of much empirical research.

In particular, Jabiyev et al. (2022) conducted an econometric investigation employing the Fully Modified Ordinary Least Squares (FMOLS) methodology on time series data from 1995 to 2020. Their findings reveal that public debt has a statistically significant and negative impact on Azerbaijan's real GDP growth. This negative relationship may reflect structural inefficiencies, rent-seeking behavior in public spending, and the procyclical nature of borrowing in resource-dependent economies. They argue that the fiscal expansion may undermine rather than support sustainable development trajectories unless debt-financed expenditures are channeled into productivity-enhancing sectors, particularly those outside the oil and gas industry (Jabiyev et al., 2022).

Ibahimov et al. (2023) offer a broader comparative perspective by analyzing the macroeconomic

consequences of infrastructure investment in a panel of upper-middle-income countries, including Azerbaijan. Utilizing a dynamic panel data model with lagged dependent variables and country-specific fixed effects, their study demonstrates that a 1% increase in total infrastructure investment is associated with a 1.51% increase in GDP per capita after a three-year lag. The impact is particularly pronounced when investments are directed toward general infrastructure systems such as energy transmission and sanitation. However, road infrastructure – though still beneficial – yields a more modest 0.41% effect over a similar time horizon (Ibahimov et al., 2023). These findings suggest that not all forms of infrastructure investment generate equal macroeconomic returns, and strategic prioritization is essential.

Building upon these empirical insights, Rahsidov (2024) adopts a macro-fiscal policy lens to assess the implications of Azerbaijan's rising public debt levels. He states that excessive reliance on external borrowing, particularly when denominated in foreign currency and timed during periods of elevated oil revenues, may intensify macroeconomic vulnerabilities. These include rising interest payments, inflationary pressures, and the crowding out of private investment due to increased government borrowing in domestic financial markets. Furthermore, given Azerbaijan's exposure to global energy price cycles, such volatility may exacerbate the debt servicing burden during downturns. Rahsidov underscores the necessity of establishing robust debt sustainability frameworks, implementing institutional safeguards, and linking public borrowing to well-appraised, economically viable projects that align with national development strategies (Zolkover et al., 2022).

These studies contribute to a growing scholarly consensus that, while infrastructure investment has the potential to stimulate economic growth and accelerate structural transformation, its effectiveness is highly contingent upon the modalities of financing and institutional capacity (Ibragimov, 2022). In resource-rich economies such as Azerbaijan, the strategic use of public debt must be accompanied by a comprehensive approach to fiscal governance. This includes rigorous cost-benefit analyses, transparent procurement processes, realistic revenue forecasts, and adherence to macroeconomic stability principles. Without such safeguards, the developmental benefits of infrastructure-led growth may be undermined by debt overhang and fiscal distress. Thus, the literature emphasizes the need for an integrated policy framework that balances growth ambitions with prudent debt management, particularly in economies undergoing the dual challenge of diversification and volatility management.

## RESEARCH METHOD

This study employs a qualitative research design rooted in systematic literature review and document analysis to explore the role of public borrowing in shaping infrastructure development strategies in Azerbaijan. The central aim is to assess how debt-financed infrastructure investments align with

the country's broader development agenda – particularly the dual objectives of promoting long-term sustainability and fostering economic diversification. These goals are part of Azerbaijan's strategic shift from a hydrocarbon-dependent growth model toward a more resilient, inclusive, and diversified economy (World Bank, 2023b; IMF, 2025).

Qualitative research, particularly document analysis, offers the methodological flexibility and interpretive depth required to investigate policy processes that are inherently multidimensional, dynamic, and embedded in institutional and geopolitical contexts (Bowen, 2009; Patton, 2015). In this regard, qualitative document analysis was employed to decode not only the manifest content of policy documents – such as infrastructure investment plans, government strategies, and multilateral development agreements – but also to uncover latent meanings, ideological framings, and strategic narratives embedded in these texts. This approach is especially valuable in contexts like Azerbaijan, where public debt instruments are financial mechanisms and vehicles of political intent, international alignment, and long-term economic vision (Brinkerhoff & Brinkerhoff, 2015).

The analysis was structured to extract both surface-level information (e.g., stated objectives, investment mechanisms, institutional roles) and deeper thematic patterns, including the discursive legitimization of borrowing, trade-offs between growth and environmental sustainability, and the ethical dimensions of intergenerational debt (Schmidt, 2008; Sunny et al., 2025). This dual-level reading enabled the study to trace how infrastructure policies are framed within national development narratives and how they resonate with global frameworks, such as the UN Sustainable Development Goals (UNDP, 2022) and the Paris Agreement targets on climate-resilient infrastructure finance (OECD, 2021).

Moreover, this methodological approach permits an evaluation of coherence between Azerbaijan's internal policy logic and its international financial partnerships – notably with institutions such as the Asian Development Bank, the European Bank for Reconstruction and Development, and the World Bank – whose frameworks often introduce sustainability-linked lending criteria and ESG (environmental, social, and governance) metrics into national borrowing strategies (ADB, 2022; EBRD, 2024). Through this lens, the study offers a critical examination of the operationalization of public debt within the country's developmental trajectory, highlighting both policy innovation and the structural constraints imposed by global economic and environmental expectations.

Data collection was conducted over five months, from January to May 2025. The document sample was delimited to materials published between 2019 and 2025

to capture the most recent developments and policy shifts, particularly in response to global economic pressures and sustainability mandates following the COVID-19 pandemic and the global energy transition. A purposive sampling strategy was employed, based on pre-established inclusion criteria prioritizing relevance to infrastructure investment, public debt management, and environmental policy integration. These included official policy documents, strategy papers, and implementation reports from the Ministry of Economy and the Ministry of Finance of the Republic of Azerbaijan; as well as evaluation reports, technical assessments, and funding proposals from major international financial institutions, notably the European Bank for Reconstruction and Development (EBRD), the Asian Development Bank (ADB), and the World Bank. This research focused on the following infrastructure works: Water Infrastructure of Ganja City, Development of Middle Corridor Transport Infrastructure, Modernization of the Baku Metro, Network Green Ports, and Renewable Energy Initiatives.

In addition to these national and institutional sources, the study incorporated selected international frameworks and policy references to assess Azerbaijan's positioning within global sustainability and climate finance narratives. These documents included policy instruments and communications derived from the European Green Deal, the Paris Agreement, and the outcomes of recent United Nations Climate Change Conferences (COP summits). This inclusion provided a comparative benchmark and enabled the triangulation of national development strategies with international sustainability imperatives. By drawing on this diverse and multi-level corpus, the study could trace the intersections between fiscal policy, infrastructure development, and environmental governance, thus offering a holistic and policy-relevant account of the role of public borrowing in Azerbaijan's developmental trajectory.

## **RESULTS**

The results of this study show the current situation with infrastructure in key sectors of the Azerbaijani economy. Over the past five years, the government has directed a significant portion of state borrowing to develop the transport sector. The priority goals of this funding were the expansion of the Baku Metro system and the modernization of the country's railway networks.

### **Railway infrastructure development**

The data in Table 1 show that the railway infrastructure is expanding significantly, turning Azerbaijan into one of the geographical transport centers in the international arena.

Table 1. The dynamics of the development of railway infrastructure in Azerbaijan

Indicator	2019	2020	2021	2022	2023	Change (2023 to 2019, %)
Total length of operated lines, km	2.140	2.139	2.139	2.138	2.180	1.87
Electric	1.169	1.169	1.157	1.157	1.151	-1.54
Freight transportation, thousand tons	15.222	14.631	15.058	18.730	18.276	20.0
International	11.925	11.814	12.020	15.273	15.007	25.84
Transit	3.796	4.132	4.585	7.478	6.871	81.0
Local	3.297	2.817	3.038	3.457	3.269	-0.85
Freight turnover, million tons-km	5.152	4.861	5.316	7.097	6.740	30.82
International	4.359	4.257	4.589	6.363	6.138	40.81
Transit	2.104	2.120	2.272	4.040	3.668	74.33
Local	793	604	727	734	602	-24.08
Passenger transportation, thousand passengers	3.850	2.124	2.826	5.137	7.185	86.62
International	219	29	-	-	-	-
Local	3.631	2.095	2.826	5.137	7.185	97.88
Passenger turnover, million passenger-km	544	172	104	194	314	-42.28
International	81	11	-	-	-	-
Local	463	161	104	194	314	-32.18
Passenger transportation, thousand passengers	338,5	332,2	353,0	378,9	369	9.01
International	141,3	81,0	36,8	37,8	43,7	-69.07
Local	299.772	274.827	284.751	398.967	439.591	46.64
Passenger turnover, million passenger-km	283.172	270.579	282.914	394.140	430.317	51.96
International	247.518	235.502	245.020	337.433	370.620	49.73
Local	77.989	74.333	81.953	159.381	173.118	121.98
Average distance of freight transportation, km	35.654	35.077	37.894	56.707	59.697	67.43
Average distance of passengers transportation, km	16.600	4.248	1.837	4.827	9.274	-44.13
Revenue from transportation, thousand AZN	7.983	1.570	-	-	-	-
FROM freight transportation	8.617	2.678	1.837	4.827	9.274	7.62
international	340.696	399.041	364.071	397.941	501.159	47.10
Transit	260.646	273.927	247.469	251.589	174.957	-32.87
Local	80.050	125.114	116.602	146.352	326.202	307.50
From passenger transportation	6.379	5.557	5.213	4.754	4.054	-36.45
International	472,7	543,5	577,0	924,2	1.200,3	153.92
Local	1.254	1.171	410	71	76	-93.94
Transportation costs, thousand AZN	1.254	721	410	71	76	-93.94
For freight transportation	7.156	5.699	5.523	5.470	5.485	-23.35
For passenger transportation	218	218	226	196	193	-11.48
Number of employees, people	389	367	201	201	285	-26.73

Source: The State Statistical Committee of the Republic of Azerbaijan (2024).

Table 1 presents the transportation sector's key operational and financial indicators from 2019 to 2023. Over this period, the total length of operated lines remained relatively stable, fluctuating slightly around 2,140 kilometers, with electric lines showing a minor decline from 1,169 km in 2019 to 1,151 km in 2023. Freight transportation volumes exhibited growth, increasing from 15,222 thousand tons in 2019 to a peak of 18,730 thousand tons in 2022 before slightly declining

to 18,276 thousand tons in 2023. This trend is mirrored in freight turnover, which rose from 5,152 million tons-km in 2019 to 7,097 million tons-km in 2022, then decreased marginally in 2023.

International and transit freight transportation consistently constituted a significant share of total freight volumes, with transit freight showing substantial growth, nearly doubling from 3,796 thousand tons in 2019 to 7,478 thousand tons in 2022, before declining to 6,871

thousand tons in 2023. Passenger transportation showed a marked increase, particularly in local passenger numbers, which more than doubled from 3,631 thousand passengers in 2019 to 7,185 thousand in 2023. Correspondingly, passenger turnover increased significantly, highlighting greater mobility within the local transport sector.

Average freight and passenger transportation distances generally increased over the period, indicating longer journey lengths and possibly an expansion of service reach. Revenues from transportation reflected fluctuating trends; freight transportation revenue increased overall, especially international freight revenue, which rose substantially from 340,696 thousand AZN in 2019 to 501,159 thousand AZN in 2023. Conversely, revenue from passenger transportation showed a moderate decline.

Transportation costs decreased notably between 2019 and 2023, particularly for freight transportation, which may indicate improved operational efficiency or cost optimization measures. The number of employees experienced a sharp decline from 389 in 2019 to 201 in 2021 and 2022, with a partial recovery to 285 employees in 2023, suggesting organizational restructuring during the period.

Thus, the data indicate that the transportation sector has stable infrastructure capacity, growing freight and passenger volumes, and its operational dynamics reflect broader economic and policy changes. These overarching trends set the stage for examining how targeted initiatives – most notably the Trans-Caspian International Transport Route and key port investments – have reinforced Azerbaijan's strategic position as a vital transit hub between Europe and Asia.

The Trans-Caspian International Transport Route (Middle Corridor) has achieved significant financial stabilization by international partners, provided smoother trade flows, and ensured Azerbaijan's presence as an important transit hub between Europe and Asia. In addition, investments in ports, especially the Port of Baku, strengthen Azerbaijan's role in global chains.

Azerbaijan is actively securing international funds to expand energy projects, electrify railway networks, and develop the Caspian-Black Sea-Europe energy corridor (Railway.Supply, 2025). These initiatives align with the country's commitment to achieving 30 percent of domestic electricity production from renewable sources by 2030 and realizing energy savings through diversified supply (Trends Research, 2024).

Furthermore, Azerbaijan's infrastructure financing boom – illustrated by plans to borrow an additional USD 5 billion for major transport, energy, and reconstruction projects – ensures that scarce resources are allocated efficiently and yield strong economic returns (Reuters, 2024). By opening up investments in roads, transportation, and energy networks, the country is not only enhancing domestic information flows and energy distribution but also strengthening its regional economic leadership (World Bank, 2019). The long-term economic benefits of these investments include increased productivity, greater foreign direct investment, improved

trade logistics, and enhanced structural resilience. As Azerbaijan continues on this path, effective public debt management will remain a critical element in ensuring fiscal sustainability while managing rapid infrastructure expansion (Reuters, 2024).

Post-2020, Azerbaijan has seen several high-profile infrastructure projects financed through public debt and multilateral partnerships. These projects demonstrate the government's strategic approach to using foreign financing to modernize key sectors.

### Water Infrastructure of Ganja City

In the water infrastructure sector of Ganja, Azerbaijan's second-largest city, the European Bank for Reconstruction and Development (EBRD) has committed a sovereign loan of €35 million under its Green Cities Program to support the urgent rehabilitation and modernization of the city's aging water supply, sanitation, and stormwater management systems. This investment constitutes the initial phase of a comprehensive Priority Investment Program, which envisions a total project cost of approximately €410 million, aiming to align Ganja's urban infrastructure with sustainable development and climate resilience goals (European Bank for Reconstruction and Development [EBRD], 2024). The project includes the renewal of key infrastructure components, such as main water pipelines, wastewater treatment facilities, and stormwater drainage channels, with a strong emphasis on energy efficiency, climate adaptation, and the reduction of water losses.

Historically, Ganja has faced significant infrastructure and service delivery challenges in its water sector. As of 2018, only 53 percent of the city's roughly 335,600 residents had access to a consolidated 24-hour potable water supply. Meanwhile, a mere 31 percent benefited from improved water quality that met health and safety standards (Swiss Agency for Development and Cooperation [SDC], 2018). These shortfalls have contributed to recurrent public health risks, environmental degradation, and growing socio-economic disparities in access to essential services. The EBRD-financed intervention is specifically designed to redress these deficiencies by expanding coverage, ensuring reliable and continuous service, and enhancing the quality of water treatment and delivery. Moreover, the project is expected to strengthen the institutional capacity of local service providers through technical cooperation and policy dialogue, laying the groundwork for long-term sustainability in urban water governance. As part of the Green Cities strategic framework, the investment also aims to embed environmental and social safeguards, promote resource-efficient urban planning, and catalyze further donor and private-sector co-financing.

### Development of Middle Corridor Transport Infrastructure

In a significant step towards increasing regional connectivity, the European Union (EU) has allocated €10 billion to finance the development of railways, ports, and digital infrastructure along the Trans-Caspian International Transport Route (Middle Corridor).

The initiative is designed to increase the decarbonization of trade operations and ensure the seamless transit of goods, with the aim of transforming the Middle Corridor into a critical trade artery that promotes economic integration between Central Asia, the Caucasus, and Europe. The project focuses on modernizing transport infrastructure to streamline the flow of goods, promote sustainability, and increase the efficiency of trade routes (EU, 2025).

In a significant effort to enhance regional connectivity, the European Union (EU) has allocated €10 billion to support the development of the Trans-Caspian International Transport Route, commonly known as the Middle Corridor. This strategic initiative focuses on modernizing railways, expanding port infrastructure, and integrating digital technologies along the route connecting Central Asia, the Caucasus, and Europe. The overarching objective is to decarbonize trade operations, streamline the flow of goods, and transform the corridor into a vital axis of economic integration between East and West (EU, 2025).

The Middle Corridor, which links Europe to Central Asia via Azerbaijan, Georgia, and Kazakhstan, has grown significantly since its official establishment in 2014. As of recent estimates, over 2.7 million tonnes of freight have already transited through the corridor, demonstrating its increasing importance in global trade logistics. With the support of EU funding, the region's transport capacity is expected to increase by up to 10 million tonnes annually by 2030 (EU, 2025). This expansion will be enabled by comprehensive upgrades to railway infrastructure, enlarged port capacities – particularly at key hubs such as the Port of Baku – and the implementation of digital tools for real-time monitoring and coordination.

One of the primary goals of this investment is to reduce transit times between Europe and Central Asia. Planned infrastructure enhancements are expected to cut delivery times to approximately 15 days, thereby significantly increasing the reliability and competitiveness of regional exports on the global market. Improved efficiency along the corridor will also create new business opportunities and solidify the region's position as a strategic trade nexus (EU, 2025).

Sustainability is a core principle of the Middle Corridor development strategy. The EU's commitment to climate goals is reflected in its emphasis on greener transport modalities, including adopting electric rail systems and energy-efficient port technologies. These efforts are aligned with broader European Green Deal objectives and aim to reduce the environmental footprint of trade logistics. By prioritizing decarbonization, the initiative not only advances global climate commitments but also offers a replicable model of environmentally responsible infrastructure development in Central Asia and the Caucasus (EU, 2025).

The economic implications of this project are substantial. Beyond improving trade flows, developing the Middle Corridor is expected to spur job creation in logistics, construction, and information technology sectors. Enhanced connectivity will open new market opportunities for enterprises across the participating

regions, paving the way for stronger commercial ties and collaborative economic ventures between Europe and Central Asia (EU, 2025).

The EU's €10 billion investment in the Middle Corridor marks a transformative leap toward fostering sustainable, efficient, and integrated transport systems across Eurasia. The initiative aims to deliver long-term benefits for trade, regional development, and international cooperation by aligning infrastructure modernization with environmental and economic objectives.

### **Modernization of the Baku Metro Network**

The modernization of the Baku Metro Network, a critical infrastructure project, is a major step towards improving urban mobility and sustainability in the Azerbaijani capital. The European Investment Bank (EIB) has partnered with Azerbaijan by providing technical assistance to reconstruct the metro system (AMCHAM, 2022). The project is part of Azerbaijan's broader vision to improve its urban mobility strategy, which aims to reduce traffic congestion, reduce environmental impact, and provide more reliable public transport options for its growing population (ADB, n.d.). The Baku Metro, which began operating in 1967, is now the backbone of the city's public transport system, serving over 350,000 passengers daily. It covers 40.3 kilometers and consists of three lines: the 32.2 km Red Line, the 2.2 km Green Line, and the 5.8 km Purple Line. Despite its importance, the metro has faced challenges in terms of capacity, aging infrastructure, and the need for modernization to keep up with the rapid growth of Baku, which has a population of over 2.5 million. The increase in population, combined with increased vehicle ownership, has contributed to increased traffic congestion, further highlighting the need for improved public transport solutions (Rail Journal, 2024).

ADB's partnership with Azerbaijan aims to address these challenges by modernizing existing stations, expanding metro lines, and integrating new technologies. This includes upgrading station facilities to accommodate more passengers, improving safety and accessibility features, and expanding the metro network's reach to underserved areas. The project also includes using energy-efficient and environmentally friendly technologies, such as electric trains and energy-efficient infrastructure, to reduce the carbon footprint of public transport. This aligns with Azerbaijan's long-term goals to promote sustainable urban development and support green development initiatives. One of the key outcomes of the modernization project is expected to be a significant reduction in travel times and congestion. Expanding the metro lines and integrating more advanced technologies will allow the Baku Metro to carry even greater passenger volumes, potentially reducing pressure on road traffic and eliminating congestion. The aim is to make the metro a more reliable and efficient mode of transport, which is particularly important in a city like Baku, where traffic congestion has become a significant obstacle to economic productivity and quality of life (Rail Journal, 2024).

### Green Ports and Renewable Energy Initiatives

Azerbaijan's push for green ports and renewable energy initiatives reflects a deep commitment to creating a sustainable and diversified energy economy. With abundant renewable sources such as wind, solar, and hydropower, the country has set ambitious targets for integrating clean energy into its infrastructure. In 2023, Azerbaijan's renewable energy capacity reached 1,748.6 MW, accounting for 20.86% of its total electricity generation capacity (Azernews, 2024). The country's long-term energy strategy aims to significantly expand this share by targeting 30% of its total energy consumption to come from renewable sources by 2030 (Minenergy, 2023). Azerbaijan's renewable energy potential is enormous, with estimates indicating the capacity to generate 3,000 MW from wind power, 23,000 MW from solar power, and 520 MW from hydroelectric power. This vast renewable energy potential is of critical importance as Azerbaijan aims to reduce its dependence on fossil fuels and establish itself as a regional leader in clean energy production.

Modernizing Azerbaijan's port infrastructure is central to the country's efforts to green its economy. Caspian Sea ports, which play a key role in regional trade, are being upgraded to minimize their environmental impact and increase operational efficiency. The initiative aims to integrate renewable energy sources such as solar and wind into port facilities, reducing the need for fossil-fuel-based energy. The aim is to make port operations more sustainable by using clean energy for various port functions, including cranes, storage, and other equipment (RE, 2025). In doing so, Azerbaijan ensures that its ports contribute to the country's broader environmental goals of reducing carbon emissions and supporting the transition to a green economy. These changes are not only beneficial for environmental sustainability, but also increase port efficiency by implementing digitalization technologies that streamline operations, reduce waiting times, and improve overall logistics.

A combination of domestic resources and international investments supports financing for these green projects. Azerbaijan has successfully secured financing from major global financial institutions such as the World Bank (2023a, 2020). These institutions provide financial support to facilitate the implementation of renewable energy solutions in the country's port infrastructure. For example, in December 2022, Azerbaijan entered into a partnership with Fortescue Future Industries (FFI), an Australian company, to develop green hydrogen and other renewable energy projects. This partnership is expected to play a significant role in helping Azerbaijan achieve its clean energy goals and create a sustainable energy economy (Minenergy, 2023). In addition, Azerbaijan's cooperation with the European Union (EU) and other international institutions highlights the importance of international cooperation in advancing the country's green transition process. With the support of these partnerships, Azerbaijan is poised to accelerate its efforts to build a low-carbon

economy while strengthening its regional trade network (Bayramov, 2024).

As Azerbaijan moves towards net-zero emissions by 2035, its focus on green ports and renewable energy offers significant opportunities for economic growth. Modernizing ports not only supports environmental sustainability, but also contributes to the efficiency of trade logistics and makes Azerbaijan a more attractive destination for global trade. By reducing carbon emissions and increasing energy efficiency, these green initiatives will lead to cost savings, increased productivity, and a cleaner environment. In addition, integrating digital technologies into port operations will further facilitate trade processes and help Azerbaijan position itself as a leading hub for sustainable trade in the Caspian region. The country's efforts to develop green ports and renewable energy initiatives align with international climate action goals, as the Paris Agreement outlines, to limit global warming and accelerate the transition to a low-carbon economy (United Nations, 2021).

Azerbaijan's commitment to green ports and renewable energy initiatives demonstrates a forward-looking approach to environmental protection and economic sustainability. By modernizing its infrastructure, leveraging renewable energy, and attracting international investment, Azerbaijan is on track to become a regional leader in sustainable development. The country's proactive efforts to integrate clean energy into its economy and port infrastructure are not only helping to reduce carbon emissions, but are also creating new opportunities for growth and innovation in trade and logistics. As Azerbaijan continues to expand its renewable energy potential and modernize its ports, it is setting a global example of how developing economies can balance economic growth with environmental responsibility.

### CONCLUSION

This study has demonstrated that Azerbaijan has adopted a strategically calibrated approach to public borrowing as a tool for financing critical infrastructure investments aimed at achieving two interlinked national priorities: economic diversification and sustainable development. Through a qualitative document analysis of government reports, development strategies, multilateral financing documents, and policy statements, the research explored how debt-financed infrastructure projects are being utilized not merely as fiscal instruments, but as catalysts for structural transformation. The findings suggest that Azerbaijan's infrastructure development agenda is consciously aligned with broader national strategies that seek to reduce hydrocarbon dependency, expand non-oil sectors, and enhance resilience to economic and environmental shocks.

Flagship initiatives such as the development of the Trans-Caspian International Transport Route (Middle Corridor), the modernization and expansion of the Port of Baku, electrification of key railway segments, and the creation of the Caspian-Black Sea-Europe energy and logistics corridors exemplify this alignment. These projects have been designed not only to enhance regional

connectivity and trade integration but also to meet sustainability targets through improved energy efficiency, reduced emissions, and the promotion of modal shifts in transport. These findings corroborate existing literature that underscores the transformative role of well-targeted infrastructure investments in stimulating inclusive and sustainable economic growth (Calderón & Servén, 2014; Bhattacharya et al., 2019; OECD, 2019).

Azerbaijan's strong macro-fiscal position – characterized by a low public debt-to-GDP ratio, high sovereign creditworthiness, and substantial foreign exchange reserves—has provided a robust foundation for mobilizing external financing without undermining fiscal sustainability (IMF, 2025). This fiscal prudence aligns with the IMF's framework for sustainable debt management, which posits that borrowing is justified when directed toward productive capital formation that contributes to long-term growth (Hakura, 2020). Moreover, Azerbaijan's participation in green and climate-resilient investment programs, such as those supported by the European Bank for Reconstruction and Development (EBRD) and the World Bank, signals a growing orientation toward aligning national development with global environmental priorities (ADB, 2021).

Thereby, Azerbaijan offers an instructive example of how public debt, when prudently managed and strategically allocated, can serve as a powerful lever for structural economic transformation. As other emerging economies confront similar challenges of diversification and decarbonization, the Azerbaijani case illustrates the importance of aligning financial instruments with long-term national visions, supported by robust institutions, fiscal discipline, and multilateral cooperation.

### Recommendations

Based on this study's findings, several key suggestions are proposed to enhance the efficiency, inclusiveness, and sustainability of Azerbaijan's public debt-financed infrastructure strategy.

- Azerbaijan should enhance its public investment management systems by adopting standardized project appraisal methods, conducting rigorous cost-benefit analyses, and incorporating climate risk assessments. This will improve the efficiency and sustainability of debt-financed infrastructure projects.

- Mainstreaming climate-resilient infrastructure by developing and enforcing guidelines that ensure new projects are designed to withstand environmental risks and align with the country's commitments to decarbonization and sustainable growth is crucial.

- Azerbaijan should expand and improve public-private partnerships (PPPs) by establishing a centralized PPP unit and adopting international best practices. This approach can mobilize private capital and technical

expertise while enhancing transparency and risk management.

- The government should promote regional integration and connectivity by enhancing cross-border cooperation on customs procedures, regulatory frameworks, and trade facilitation measures. Strengthening these areas will maximize the benefits of strategic projects such as the Trans-Caspian Transport Route and the Port of Baku.

- To assess the effectiveness of investments in infrastructure projects, the government should implement robust monitoring and evaluation systems that incorporate real-time data collection and stakeholder feedback. Such systems will enable policymakers to effectively track the social and economic impacts of infrastructure investments and make necessary adjustments.

- Azerbaijan should maintain prudent debt management practices by conducting regular debt sustainability analyses and stress tests. This will help safeguard macroeconomic stability against potential external shocks and ensure fiscal responsibility.

- Finally, the country should strengthen international partnerships by actively seeking technical and financial assistance from multilateral development banks and climate finance institutions. These collaborations can accelerate infrastructure modernization while reinforcing environmental and governance standards.

### Limitations of the Study

While this study illuminates the coherence between borrowing practices and policy objectives, it does not quantitatively assess the socio-economic outcomes of these investments. As highlighted in critical infrastructure literature, the ultimate developmental impact of infrastructure projects depends heavily on implementation quality, institutional capacity, governance integrity, and contextual socio-political factors (Flyvbjerg, 2013; Ansar et al., 2016). Risks of cost overruns, project delays, or suboptimal use remain pertinent, particularly in regions undergoing institutional transition.

Therefore, future research should employ mixed-methods designs that integrate econometric analysis, spatial modelling, and institutional diagnostics to evaluate project-level outcomes across dimensions such as employment generation, regional inequality, private sector activation, and environmental performance. Moreover, assessing the role of digital governance tools, public-private partnerships (PPPs), and climate risk assessment frameworks could yield insights into how Azerbaijan can further enhance the effectiveness and resilience of its infrastructure investments.

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