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ASSESSMENT OF INFRASTRUCTURE ASSET MANAGEMENT PROJECTS OF THE ASIAN DEVELOPMENT BANK (ADB) AND THE WORLD BANK: LESSONS FOR CENTRAL ASIA AND UZBEKISTAN

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Abstract: *This study, prepared in the IMRAD format, presents a comparative institutional and financial analysis of the post-investment sustainability of infrastructure projects financed by the Asian Development Bank (ADB) and the World Bank (WB) in Central Asia. The relevance of the study is determined by the fact that Uzbekistan annually attracts USD 1–2 billion in loan resources from the WB and ADB for infrastructure development; however, mechanisms for long-term management of the assets created under such projects often remain a weak link. Based on Project Performance Evaluation Reports (PPER) and Implementation Completion and Results Reports (ICR) for 2015–2023, 42 projects in water supply, energy, and road infrastructure were analyzed. The study introduces the Asset Management Sustainability Index (AMSI). The results reveal a “donor paradox”: physical construction is successfully completed in 88% of cases, yet the financial sustainability of assets through tariffs and OPEX is achieved in only 31% of ADB projects and 42% of WB projects. The Discussion section substantiates the need to move from “project management” to “lifecycle asset management” within loan agreements.*

Keywords: *asset management, ADB, World Bank, infrastructure projects, Central Asia, Uzbekistan, AMSI index, IMRAD, lifecycle, operating expenditures (OPEX), sustainability.*

I. INTRODUCTION

Amid rapid economic growth, accelerating urbanization, and increasing pressure on public services, the infrastructure deficit remains one of the most serious structural barriers to sustainable development in the countries of Central Asia. The quality and availability of transport networks, energy systems, water supply facilities, and municipal infrastructure directly influence economic productivity, regional connectivity, investment attractiveness, and the living standards of the population. In this context, the Republic of Uzbekistan has been implementing a large-scale investment policy aimed at modernizing infrastructure and reducing accumulated gaps in basic public assets. A significant part of this policy is financed through sovereign borrowing from international financial institutions. As of 2024, the key development partners of Uzbekistan in this area are the Asian Development Bank (ADB) and the World Bank (WB), whose annual portfolio of infrastructure loans in the country, covering transport, energy, and water supply projects, amounts to approximately USD 1–2 billion.

However, international practice in public infrastructure governance demonstrates that the mere attraction of investment resources and the successful completion of construction works do not automatically guarantee the long-term sustainability of infrastructure assets. A deep systemic problem has been identified in many developing and transition economies, which the World Bank describes

as “The Build-Neglect-Rebuild Paradigm.” The essence of this paradigm is that governments, donors, and implementing agencies tend to concentrate most of their attention, institutional capacity, and financial resources on the capital investment stage, namely construction and reconstruction (CAPEX). At the same time, the subsequent stages of long-term operation, maintenance, renewal, and asset management (OPEX and Asset Management) often remain underfunded, weakly institutionalized, or insufficiently integrated into project design.

This imbalance creates significant fiscal and economic risks. Infrastructure loans are usually issued for a period of 20–30 years, while the created asset, such as a water supply facility, road, bridge, power network, or wastewater treatment plant, must operate effectively for at least the same period in order to generate economic and social returns. Only under conditions of stable operation can the expected indicators of project efficiency, including internal rate of return (IRR), net present value (NPV), and broader development impact, justify the debt burden assumed by the state. If, due to weak maintenance planning, insufficient tariff revenues, institutional fragmentation, or lack of qualified personnel, the asset begins to deteriorate after 8–10 years, the state continues to service debt for infrastructure that has partially lost its functionality or no longer provides the expected level of public service.

The relevance of this study is therefore determined by the need to reconsider the traditional approach to evaluating infrastructure projects financed by international financial institutions. In many academic and applied studies, the performance of such projects is assessed mainly through the lens of project management: timely disbursement of funds, compliance with procurement procedures, completion of construction works, and achievement of immediate output indicators. While these criteria are important, they do not fully reflect whether the created infrastructure remains financially, technically, and institutionally sustainable after the completion of external financing. In other words, the key question is not only whether the project was completed, but also whether the asset continues to operate efficiently throughout its life cycle.

This article addresses this research gap by shifting the analytical focus from the investment and construction phase to the post-investment stage of infrastructure asset management. The study aims to conduct a comparative institutional and financial analysis of asset management sustainability in infrastructure projects financed by the Asian Development Bank and the World Bank in Central Asia. Particular attention is given to the sectors of water supply, energy, and road infrastructure, where the long-term functionality of assets depends not only on engineering quality, but also on tariff policy, operational expenditure coverage, local institutional capacity, maintenance planning, and the availability of digital asset management systems.

The purpose of the article is to identify the main factors that determine the success or failure of post-investment asset management in ADB- and WB-financed projects and to formulate strategic lessons for Uzbekistan. The study argues that the transition from a narrow “project management” logic to a broader “life-cycle asset management” approach is essential for increasing the efficiency of sovereign borrowing, reducing future fiscal risks, and ensuring that infrastructure investments generate sustainable development outcomes over the long term.

II. MATERIALS AND METHODS

In accordance with the principles of empirical research and comparative institutional analysis, the methodological design of this study is based on retrospective evaluation, or ex-post analysis. This approach makes it possible to assess not only the formal completion of infrastructure projects, but also their post-investment performance, long-term operational viability, and institutional sustainability after the withdrawal of external financing. The use of ex-post evaluation is particularly relevant for infrastructure asset management, since the actual effectiveness of such projects becomes visible only several years after commissioning, when the created assets begin to operate under real financial, technical, and administrative conditions.

The empirical basis of the study consists of 42 completed infrastructure projects implemented in Central Asia during the period 2015–2023. The selected projects cover four countries of the region:

Uzbekistan, Kazakhstan, Tajikistan, and Kyrgyzstan. These countries were chosen because they share a number of common development characteristics, including high demand for infrastructure modernization, dependence on external development finance, significant public-sector involvement in infrastructure provision, and the growing role of international financial institutions in capital investment programs. At the same time, the countries differ in terms of tariff regulation, institutional maturity, fiscal capacity, and decentralization of infrastructure management, which allows for a more nuanced comparative analysis.

The sample includes projects in three key infrastructure sectors: water supply and sanitation, energy infrastructure, and road infrastructure. These sectors were selected because they represent different models of asset operation and financial sustainability. Energy projects usually have clearer payment collection mechanisms and higher commercial potential; water supply projects often depend on tariff reforms and institutional restructuring; road projects, in turn, are frequently characterized by weak cost-recovery mechanisms and strong dependence on state budget allocations for maintenance. Such sectoral diversity provides an analytical basis for identifying whether post-investment sustainability is determined primarily by donor practices, sectoral characteristics, or the institutional environment of the recipient country.

Of the 42 projects included in the research database, 22 were financed by the Asian Development Bank (ADB), while 20 were financed by the World Bank (WB). The selection of these two institutions is justified by their dominant role in financing infrastructure development in Central Asia and by the availability of standardized project evaluation documents in open-access archives. Both institutions apply formal systems of project performance assessment; however, their reports often emphasize project-level outputs and implementation results rather than the full life-cycle sustainability of the created assets. Therefore, the present study uses these reports not only as descriptive sources, but also as a basis for constructing a quantitative comparative framework.

Primary data were extracted from official independent evaluation reports of international financial institutions. For World Bank-financed projects, the main source of information consisted of Implementation Completion and Results Reports (ICR), as well as evaluation materials prepared or validated by the Independent Evaluation Group (IEG). These documents contain information on project objectives, financing structure, implementation results, efficiency indicators, institutional reforms, risks to development outcomes, and post-completion sustainability. For ADB-financed projects, the study used Project Performance Evaluation Reports (PPER) and related project completion documents published by the Independent Evaluation Department (IED). These reports provide assessments of relevance, effectiveness, efficiency, sustainability, institutional development, and lessons learned.

The study applied content analysis, comparative analysis, and structured scoring. At the first stage, all selected reports were reviewed to identify information related to the technical condition of assets, financial sustainability, institutional capacity, operation and maintenance arrangements, tariff policy, digital monitoring systems, and maintenance planning. At the second stage, the extracted information was classified according to a unified analytical framework. At the third stage, qualitative assessments contained in IFI reports were transformed into comparable quantitative indicators. This transformation was necessary because traditional evaluation reports often use broad qualitative categories such as “Successful,” “Less than Successful,” “Partly Successful,” or “Sustainable,” which are useful for general assessment but insufficient for precise cross-project and cross-sector comparison.

To overcome this methodological limitation, the author developed a quantitative Asset Management Sustainability Index (AMSI). The purpose of this index is to measure the extent to which an infrastructure asset remains technically functional, financially viable, institutionally supported, and properly maintained after project completion. Unlike traditional project performance indicators, which mainly assess construction completion and short-term implementation results, AMSI focuses on the post-investment stage and the capacity of the asset to preserve its economic and social value throughout its life cycle.

The Asset Management Sustainability Index is calculated using the following formula:

$$\text{AMSI} = (w_1 \times T_{\text{cond}} + w_2 \times F_{\text{sustain}} + w_3 \times I_{\text{cap}} + w_4 \times M_{\text{plan}}) \times 100$$

Where:

T_{cond} , or Technical Condition, reflects the physical and technical state of the infrastructure asset 3–5 years after commissioning. This indicator ranges from 0 to 1, where 0 indicates severe deterioration or loss of functionality, while 1 indicates that the asset remains in good operational condition and performs according to its intended technical parameters. This component captures whether the project delivered durable engineering results and whether the constructed or rehabilitated infrastructure has been preserved after the end of the investment phase.

F_{sustain} , or Financial Sustainability, measures the extent to which tariffs, user charges, budget allocations, or other stable financing mechanisms cover operating and maintenance expenditures, including OPEX. This indicator also ranges from 0 to 1. A low value indicates that the asset depends heavily on irregular subsidies, underfunded maintenance budgets, or politically constrained tariff systems. A high value indicates that the operating entity has sufficient and predictable resources to finance routine maintenance, repairs, staff costs, energy consumption, spare parts, and other operational needs. This component is particularly important because even technically well-built infrastructure can deteriorate rapidly if its operation is financially underfunded.

I_{cap} , or Institutional Capacity, reflects the availability of trained local personnel, management procedures, organizational competence, and digital asset management tools. This indicator includes the presence of qualified engineers and operators, the continuity of institutional support after project completion, and the use of modern systems such as SCADA, GIS, ERP, BIM, or other digital platforms for monitoring, accounting, and managing infrastructure assets. The value ranges from 0 to 1, where higher scores indicate stronger local ownership, better human capital, and more advanced management systems.

M_{plan} , or Maintenance Planning, evaluates whether the responsible institution has a formalized and financially realistic plan for routine and capital maintenance. This includes preventive maintenance schedules, asset registers, repair cycles, depreciation planning, emergency response mechanisms, and medium- or long-term maintenance budgeting. The indicator ranges from 0 to 1. A high score means that maintenance is not treated as an occasional or reactive activity, but is embedded into the management cycle of the infrastructure asset.

The weighting coefficients of the AMSI model were determined according to the relative importance of each component for long-term asset sustainability. Technical condition was assigned a weight of $w_1 = 0.30$, since the physical durability and operational state of the asset remain a fundamental prerequisite for infrastructure performance. Financial sustainability was assigned the highest weight, $w_2 = 0.35$, because stable coverage of operating and maintenance costs is the key condition for asset survival after the completion of donor financing. Institutional capacity was assigned a weight of $w_3 = 0.20$, reflecting the importance of qualified personnel, organizational competence, and digital systems. Maintenance planning was assigned a weight of $w_4 = 0.15$, as it supports the systematic preservation of the asset over time and reduces the risk of premature deterioration.

The resulting AMSI score is expressed as a percentage. An AMSI value above 75% indicates a high level of asset management sustainability. Such projects are characterized by good technical condition, adequate financial coverage of OPEX, functioning institutional arrangements, and a clear maintenance planning system. An AMSI value between 50% and 74% indicates medium sustainability. In such cases, the asset may continue to function, but there are significant risks related to underfunding, institutional weakness, insufficient maintenance, or gradual technical deterioration. An AMSI value below 50% indicates unsustainable asset management and a high probability of premature asset degradation or loss of functionality.

This methodological approach allows the study to move beyond conventional assessments of whether a project was completed on time and within budget. Instead, it enables a more comprehensive evaluation of whether the created infrastructure asset remains viable after the investment phase. The

AMSI framework also provides a basis for comparing ADB and World Bank projects across sectors and countries, identifying systemic weaknesses in post-investment asset management, and formulating practical recommendations for Uzbekistan in the context of sovereign borrowing, infrastructure governance, and life-cycle asset management.

III. RESULTS

The analysis of 42 infrastructure projects identified a significant gap between the physical implementation of projects and their post-investment sustainability. The results demonstrate the phenomenon of the “funding cliff effect,” in which the quality of asset maintenance declines sharply once loan disbursements have ended.

Table 1.
Comparative Analysis of Asset Management Sustainability (AMSI) by Sector and Donor (ADB vs WB) in Central Asia, 2015–2023

Sector (number of projects)	Donor	Technical condition (T_cond)	OPEX financial coverage (F_sustain)	Institutional capacity (I_cap)	AMSI index (%)	Long-term management assessment
Water supply and sanitation (12)	ADB	0.78	0.35	0.40	50.6%	Low (tariffs do not cover costs)
Water supply and sanitation (10)	WB	0.82	0.48	0.55	60.6%	Medium (improvements in commercial metering)
Energy (power grids) (8)	ADB	0.90	0.85	0.70	81.2%	High (cost-recovering sector)
Energy (power grids) (6)	WB	0.88	0.80	0.75	80.6%	High (SCADA and ERP implementation)
Road infrastructure (4)	ADB	0.85	0.20	0.30	43.0%	Critical (no road funds)
Road infrastructure (2)	WB	0.80	0.30	0.40	48.5%	Low (dependence on the state budget)

Source: Author’s calculations based on data from IEG (World Bank) and IED (ADB) evaluation reports for 2015–2023. The values of T_cond, F_sustain, and I_cap are weighted averages.

According to the results presented in Table 1, sectoral differences appear to be considerably more significant than donor-specific differences in determining the long-term sustainability of infrastructure asset management. In other words, the post-investment performance of infrastructure assets depends not only on whether the project was financed by the Asian Development Bank or the World Bank, but also, and to a greater extent, on the economic nature of the sector, the availability of stable revenue sources, the maturity of operating institutions, and the existence of mechanisms for financing maintenance after project completion.

The energy sector demonstrates the highest level of asset management sustainability among the analyzed infrastructure areas, with AMSI values exceeding 80% in projects financed by both international financial institutions. This can be explained by the fact that energy infrastructure is traditionally more commercialized than other public infrastructure sectors. Electricity transmission

and distribution systems are usually supported by clearer payment collection mechanisms, more predictable cash flows, stronger technical regulation, and a more direct link between service provision and revenue generation. In addition, energy projects often include the introduction of digital monitoring and control systems, such as SCADA and ERP platforms, which strengthen institutional capacity and improve the quality of operational management.

By contrast, road infrastructure projects fall into the critical sustainability zone, with AMSI values below 50%. This indicates that road projects are highly vulnerable at the post-investment stage, despite the fact that the physical construction component is usually implemented successfully. Loan resources are primarily directed toward capital-intensive works, including road rehabilitation, pavement improvement, and the construction of high-quality asphalt surfaces. As a result, the technical condition indicator may initially remain relatively high, as reflected in the value of $T_{cond} = 0.85$ for ADB-financed road projects. However, this positive technical result is not supported by an adequate long-term maintenance system.

The main weakness of road infrastructure projects is related to financial sustainability. After the completion of construction works and the withdrawal of contractors, local road authorities often lack stable and protected sources of funding for routine and periodic maintenance. The value of $F_{sustain} = 0.20$ demonstrates that maintenance expenditures are either insufficiently covered or depend heavily on annual state budget allocations, which may be irregular, politically constrained, or vulnerable to fiscal pressure. Unlike energy infrastructure, road assets usually do not generate direct user-based revenues in many Central Asian countries, and road funds or performance-based maintenance financing mechanisms are either absent or underdeveloped.

Another important limitation concerns the institutional and technical capacity of local road services. Even when roads are reconstructed according to high engineering standards, the absence of specialized maintenance equipment, trained personnel, digital asset registers, and systematic road condition monitoring leads to gradual deterioration. In such cases, the project may be formally evaluated as successful at the completion stage, but its long-term development effect decreases over time. This creates a typical post-investment sustainability problem: capital investment improves the asset in the short term, but the lack of financing and institutional responsibility for operation and maintenance accelerates its future degradation.

Thus, the findings confirm that the sustainability of infrastructure assets is shaped less by the identity of the donor and more by the sectoral model of asset operation. Commercialized sectors with revenue collection systems, such as energy, are more likely to maintain high AMSI scores, while non-commercial or budget-dependent sectors, such as roads, face substantially higher risks of premature deterioration. This conclusion is particularly important for Uzbekistan, where future infrastructure borrowing should be linked not only to construction quality, but also to the establishment of long-term maintenance financing, institutional accountability, and life-cycle asset management mechanisms.

Table 2.

Matrix of Success and Failure Factors in Infrastructure Asset Management after the Completion of IFI Loan Projects

Factor / criterion	Failure characteristics	Success characteristics
Financial resources (OPEX)	Tariffs cover only staff salaries. Repairs depend on subsidies from the central budget, which are allocated irregularly.	An automatic tariff indexation formula has been introduced within IFI covenants. A ring-fenced asset depreciation account has been created.
Institutional capacity (HR)	Training was conducted at the end of the project merely “for formality.” Because of low salaries in the public sector, certified engineers moved to	The IFI financed a long-term 3–5-year contract for institutional support and O&M capacity building after construction was completed.

Factor / criterion	Failure characteristics	Success characteristics
	the private sector within a year.	
Technology and data (IT)	No asset register exists. Wear and deterioration are monitored “by eye.” Drawings remained with the contractor in paper form.	A digital asset register (GIS/SCADA) was created. A computerized maintenance management system (CMMS) was implemented.
Government attitude	The project was perceived as “free donor money.” Local authorities lacked ownership and did not develop a sense of responsibility for the asset.	The local hokimiyat and the operator participated financially in the project through co-financing and bear political responsibility for service quality.

Source: Developed by the author based on a content analysis of 42 ADB and WB project evaluation reports.

IV. DISCUSSION

The findings obtained in this study make it possible to argue that the root cause of premature asset deterioration lies not in engineering but in the political economy of infrastructure. As ADB experts note in their self-evaluations, there is a strong structural incentive for both borrowing governments and bank managers to focus on the ribbon-cutting effect. Completion of construction is treated as a triumph, whereas routine day-to-day maintenance of the asset is politically unrewarding.

In recent years, the World Bank has attempted to introduce the Design-Build-Operate (DBO) concept in water supply projects in Central Asia. Under this approach, the contractor not only builds the facility but also operates it for 3–5 years while simultaneously training personnel. The analysis showed that in projects using DBO contracts, the institutional capacity index (I_{cap}) is, on average, 35% higher. Nevertheless, in Uzbekistan, most projects are still implemented under the outdated FIDIC Red Book scheme, where the contractor’s responsibility ends one year after handover, at the end of the Defects Notification Period.

The most critical parameter in the AMSI model proved to be $F_{sustain}$, or financial coverage. In 68% of water supply and road projects, covenants, understood as the borrower’s legal obligations, to raise tariffs to the cost-recovery level were violated by governments because of social concerns. This creates a hidden deficit: the state preserves social calm today but risks losing an asset worth USD 100 million tomorrow.

V. CONCLUSION AND FINDINGS

The main conclusion of the study is that infrastructure lending without a firmly embedded institutional and financial model of asset management is equivalent to burning capital. For Uzbekistan, as the largest IFI borrower in the region, it is necessary to reconsider the paradigm of cooperation with donors.

1. A mandatory transition is needed from “Build-and-Hand Over” contracts to DBO (Design-Build-Operate) or PBC (Performance-Based Contracts) in all ADB and WB projects so that the contractor is responsible for the asset’s operation during the first 3–5 years.

2. Feasibility studies for projects should include a mandatory Life Cycle Costing section, specifying the source of financing for asset repair and maintenance for the next 20 years, not only the source of loan repayment.

3. The Ministry of Economy and Finance of the Republic of Uzbekistan should introduce the AMSI index when accepting IFI projects. If a sectoral agency cannot justify tariff coverage of OPEX, the project should not be approved for financing.

4. IFI loan structures should include grant components, amounting to 5–7% of the total, exclusively for asset digitalization (SCADA, BIM) and the retention of certified personnel at the local level.

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