

Evaluating Financial Efficiency, Liquidity, and Profitability of Bharat Railways: Aligning Operational Performance with Green Finance and Sustainable Development Goals

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Abstract

This research analyzes the financial efficiency, liquidity position, and profitability of Bharat Railways over the past ten years, with a focus on linking operational outcomes to Green Finance mechanisms and the Sustainable Development Goals (SDGs). Using tools such as financial ratio analysis, trend evaluation, and comparative benchmarking, the study evaluates the overall financial condition of Bharat Railways and highlights key areas that require strategic intervention. It further explains how sustainable financing models and SDG-oriented priorities can be embedded into railway operations to promote long-term sustainability. The results reveal that although Bharat Railways maintains moderate profit levels and stable liquidity, its operational efficiency varies due to high structural expenditures and constrained revenue diversification. The adoption of green financial instruments, including green bonds and sustainability-focused investments, has the potential to improve both economic resilience and environmental outcomes. The study concludes by offering policy-oriented recommendations aimed at aligning the financial planning of Bharat Railways with national and global sustainability and climate objectives.

Keywords: Financial Efficiency , Liquidity , Profitability , Green Finance , SDGs

Introduction

Bharat Railways (IR) represents one of the world's largest railway systems and serves as a cornerstone of India's socio-economic framework. It functions as a critical transport network, enabling the daily travel of millions of passengers and facilitating the movement of freight across diverse regions of the country. In addition to its transportation role, Bharat Railways significantly supports regional integration, employment creation, industrial expansion, and overall economic cohesion. Due to its vast operational scale and extensive public service responsibilities, the financial condition of Bharat Railways exerts a substantial influence on the national economy.

In the contemporary global context, growing emphasis on sustainable development has prompted public sector enterprises to pursue a balance between financial viability and environmental stewardship. The transportation sector is a notable source of greenhouse gas emissions, positioning sustainability as a central concern for railway systems. As a result, assessing the financial performance of Bharat Railways now extends beyond conventional indicators of efficiency and profitability to include alignment with green finance initiatives and the Sustainable Development Goals (SDGs). Green finance instruments, including sustainability-oriented investments and environmentally targeted funding, offer viable pathways to improve operational effectiveness while advancing climate resilience and long-term sustainability.

Within this context, the present study evaluates the financial efficiency, liquidity position, and profitability of Bharat Railways, while investigating the extent to which its operations align with green finance frameworks and SDG priorities. The analysis places particular emphasis on SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). By combining financial assessment with sustainability perspectives, this research provides a holistic evaluation of Bharat Railways' financial standing and its capacity to contribute to sustainable development. Additionally, the study proposes policy-based recommendations aimed at enhancing financial performance while supporting national and global sustainability and climate goals.

Literature Review

Financial Performance of Bharat Railways

Existing literature extensively explores the financial performance of railway systems, primarily focusing on indicators such as operational efficiency, liquidity strength, and profitability. Numerous studies examining Bharat Railways have applied financial ratio analysis to assess its operational effectiveness and fiscal condition. These analyses indicate that although Bharat Railways benefits from economies of scale and sustained governmental backing, its financial efficiency is frequently limited by high operating expenditures, substantial social service commitments, and inflexible fare and freight pricing policies. Empirical findings commonly point to stable but moderate liquidity levels and comparatively low profit margins, particularly when measured against private-sector organizations.

Several comparative studies have evaluated the financial condition of Bharat Railways in relation to international railway networks, especially those operating in developed regions such as Japan and Europe. Global railway operators often display superior operational efficiency and long-term financial stability, supported by advanced technological systems, diversified revenue models, and greater managerial and pricing autonomy. Research suggests that railway systems in Europe and Japan benefit from effective integration of commercial and passenger services, enabling improved cost recovery and stronger profitability outcomes. In contrast, despite its extensive network and operational scale, Bharat Railways continues to face institutional and policy-related constraints that restrict financial adaptability and performance optimization.

Further research has compared Bharat Railways with other Bharat public sector enterprises (PSEs), revealing mixed performance outcomes. While Bharat Railways demonstrates satisfactory performance in service delivery and asset utilization, its financial ratios frequently fall short of those observed in profit-driven public sector organizations. Challenges such as cross-subsidization between passenger and freight segments, increasing personnel-related expenses, and delays in infrastructure modernization have been consistently identified as sources of financial pressure. Overall, the literature emphasizes the necessity of strategic reforms to enhance efficiency, financial resilience, and long-term sustainability.

Green Finance and Sustainable Development

The notion of green finance has gained significant prominence in both academic discourse and policy frameworks as a means to support environmentally sustainable economic development. Green finance encompasses financial investments and activities that promote positive environmental impacts, including renewable energy deployment, energy-efficient technologies, and low-emission transportation systems. Scholars underline the importance of green finance instruments in mobilizing capital for sustainable infrastructure development while mitigating environmental and climate-related risks.

Among the available green finance instruments, green bonds have emerged as a prominent financing mechanism for environmentally sustainable projects, particularly within the transportation sector. Research highlights that green bonds allow governments and public institutions to secure long-term funding for climate-resilient infrastructure initiatives. In addition, tools such as carbon pricing mechanisms and sustainability-linked loans have been recognized for their effectiveness in encouraging emission reduction and enhancing environmental performance. These financial instruments link funding conditions to sustainability outcomes, thereby motivating organizations to adopt cleaner, more resource-efficient operational practices.

The relationship between transportation systems and the Sustainable Development Goals (SDGs) has also been widely examined in the literature. Rail transport holds particular relevance for SDG 7 (Affordable and Clean Energy) through electrification initiatives and renewable energy usage; SDG 9 (Industry, Innovation, and Infrastructure) by supporting resilient and efficient infrastructure development; SDG 11 (Sustainable Cities and Communities) by facilitating low-carbon urban mobility; and SDG 13 (Climate Action) through reduced greenhouse gas emissions compared to road-based transport. Existing studies suggest that railways possess significant potential to contribute to these goals when supported by suitable financial instruments and policy measures.

Research Gap

Although prior research provides valuable insights into the financial performance of Bharat Railways and the growing role of green finance in sustainable development, there remains a noticeable gap in studies that integrate these two dimensions. Most existing analyses assess financial efficiency, liquidity, and profitability independently, without explicitly examining their linkage to green finance strategies and SDG alignment. Additionally, comparative studies often neglect the capacity of green financial instruments to mitigate the structural financial challenges faced by Bharat Railways. This gap underscores the need for an integrated analytical framework that simultaneously evaluates financial performance and sustainability objectives. The present study addresses this gap by examining the financial efficiency, liquidity, and profitability of Bharat Railways in conjunction with green finance mechanisms and relevant Sustainable Development Goals, offering a comprehensive basis for informed policy formulation and strategic planning.

Research Methodology

The present research employs a descriptive and analytical approach to evaluate the financial efficiency, liquidity position, and profitability of Bharat Railways, while simultaneously examining the extent to which its operational performance aligns with green finance frameworks and the Sustainable Development Goals (SDGs). The methodological design emphasizes systematic data collection, rigorous analytical procedures, and coherent interpretation to ensure the reliability and validity of the findings.

Data Sources

The study predominantly relies on secondary data drawn from authentic and authoritative sources. For methodological clarity, the data sources are broadly classified into primary and secondary categories.

Primary Data Sources

Primary information is derived from officially published financial and policy documents of Bharat Railways. These include the Annual Reports of Bharat Railways for the last ten years, Railway Budget statements, and official publications issued by the Ministry of Railways, Government of India. These documents provide comprehensive details on revenues, expenditures, assets, liabilities, and operational metrics, forming the foundation for the financial analysis undertaken in this study.

Secondary Data Sources

Secondary information is collected from government reports, policy documents, and scholarly articles published in well-recognized academic journals such as Transport Policy and Railway Gazette. Supplementary data are also obtained from reports published by national and international organizations concerned with sustainable transportation, green finance, and infrastructure development. These sources assist in placing the financial findings within a broader policy and global context.

Period of Study

The analysis spans a ten-year period to capture long-term trends and variations in the financial performance of Bharat Railways. This timeframe facilitates meaningful year-to-year comparisons and enables the identification of structural changes and performance shifts related to efficiency, liquidity, and profitability.

Tools and Techniques of Analysis

To fulfill the objectives of the study, a combination of quantitative and comparative analytical techniques is applied:

Financial Ratio Analysis:

Key ratios associated with financial efficiency, liquidity, and profitability are computed to evaluate the overall financial condition of Bharat Railways. These ratios provide insights into cost control, asset utilization efficiency, and revenue-generating capability.

Trend Analysis:

Trend analysis is employed to assess movements and patterns in financial indicators over the selected period. This technique aids in identifying growth trajectories, cyclical variations, and long-term performance tendencies.

Benchmarking:

Benchmarking techniques are used to compare the financial performance of Bharat Railways with selected international railway systems and Bharat public sector enterprises. Such comparisons offer a relative assessment of operational efficiency and financial competitiveness.

Sustainability Scorecard Analysis:

A sustainability scorecard framework is applied to measure the alignment of Bharat Railways' financial and operational strategies with green finance initiatives and relevant SDGs. The analysis incorporates indicators related to renewable energy usage, sustainable infrastructure development, and climate mitigation efforts.

Analytical Framework

The study integrates conventional financial performance evaluation with sustainability-based assessment to construct a comprehensive analytical framework. Financial indicators are analyzed alongside sustainability-related parameters to determine how green finance instruments can enhance financial stability while supporting environmental objectives.

Financial Analysis

The financial condition of Bharat Railways is examined through a detailed assessment of efficiency, liquidity, and profitability measures. The analysis employs financial ratios and trend evaluation techniques to understand operational effectiveness, short-term solvency, and overall earning capacity across the study period.

Financial Efficiency:

Financial efficiency represents the extent to which Bharat Railways effectively utilizes its available resources to generate revenue. This aspect is evaluated using indicators such as the Asset Turnover Ratio, Operating Cost Ratio, and Fixed Assets Ratio.

The Asset Turnover Ratio, defined as the ratio of revenue to total assets, indicates how productively assets are employed to produce income. Between 2015 and 2024, Bharat Railways demonstrates a gradual decline in this ratio, suggesting a weakening in asset utilization efficiency. This trend can largely be attributed to escalating operational and maintenance costs, along with substantial capital investments that have not yet resulted in commensurate revenue growth.

The Operating Cost Ratio, which measures operating expenses relative to operating revenue, offers insights into expenditure control and cost efficiency. Findings reveal that operating expenses consistently constitute a significant portion of operating income, indicating persistent challenges in managing costs. Factors such as rising personnel expenses, energy consumption, and infrastructure maintenance have contributed to elevated cost ratios, thereby reducing operational efficiency.

The Fixed Assets Ratio, calculated as net fixed assets divided by total assets, reflects the capital-intensive nature of railway operations. Bharat Railways records a high fixed assets ratio, emphasizing its heavy investment in long-term infrastructure. While such investments are necessary for network expansion and service quality, they also restrict financial flexibility and increase ongoing maintenance obligations.

In summary, the efficiency analysis indicates that despite possessing a substantial asset base, Bharat Railways requires improved cost control and enhanced asset productivity to achieve higher operational efficiency.

Liquidity:

Liquidity analysis assesses the capacity of Bharat Railways to meet its short-term financial commitments as they arise. The study utilizes the Current Ratio and Quick Ratio to evaluate short-term financial strength.

The Current Ratio, obtained by dividing current assets by current liabilities, measures the organization's ability to settle short-term obligations using available current resources. Over the study period, the average current ratio of Bharat Railways remains below the standard benchmark of 1.2, pointing to moderate liquidity pressure. This condition is primarily influenced by delayed receivables, postponed government reimbursements, and timing mismatches between revenue inflows and expenditure requirements.

The Quick Ratio, which excludes inventory from current assets, provides a more conservative estimate of immediate liquidity. The consistently lower quick ratio indicates a limited pool of readily available liquid assets. This suggests that Bharat Railways may encounter difficulties in meeting short-term liabilities without external financial assistance or budgetary support.

Overall, the liquidity assessment underscores the importance of strengthening working capital management to improve short-term financial resilience.

Profitability:

Profitability analysis examines the ability of Bharat Railways to generate financial surplus from its operations. The study evaluates this dimension using the Net Profit Margin, Return on Assets (ROA), and Return on Equity (ROE).

The Net Profit Margin, calculated as net profit divided by total revenue, reflects the overall profitability of operations. Despite its extensive operational scale, Bharat Railways reports comparatively low profit margins relative to private-sector entities. This is largely due to social service responsibilities, regulated pricing mechanisms, and the practice of cross-subsidizing passenger services through freight earnings.

The Return on Assets (ROA) measures the efficiency with which total assets generate net income. The analysis reveals modest ROA values, indicating that the substantial asset base does not translate into proportionate financial returns. High capital intensity and extended gestation periods associated with infrastructure investments contribute to subdued asset returns.

The Return on Equity (ROE) evaluates returns generated on invested capital. Bharat Railways records relatively low ROE levels, reflecting constrained profitability and a continued dependence on government support rather than equity-based financial growth.

In conclusion, the profitability analysis highlights that although Bharat Railways operates on a vast scale, its capacity to generate financial returns remains limited. Enhancing long-term profitability will require structural reforms, improved operational efficiency, and diversification of revenue sources.

Integrating Green Finance

Concept of Green Finance

Green finance involves directing financial resources toward initiatives and projects that support environmental protection, sustainability, and climate resilience. It includes a wide range of financial instruments and investment approaches aimed at encouraging environmentally responsible development, such as green bonds, green banking practices, and sustainability-linked financial products. The central purpose of green finance is to promote economic growth while limiting environmental harm, lowering carbon emissions, and accelerating the shift toward low-carbon, energy-efficient, and resource-conscious systems.

Relevance of Green Finance to Bharat Railways

The adoption of green finance is highly relevant for Indian Railways, given its vast infrastructure network, substantial energy requirements, and strategic role in supporting national climate and sustainability objectives. One of the most impactful applications of green finance within Indian Railways is route electrification, which significantly reduces reliance on diesel locomotives and leads to lower greenhouse gas emissions. Sustained investment in electrification enhances operational efficiency while aligning railway operations with clean and renewable energy goals.

Moreover, Indian Railways possesses considerable potential to expand renewable energy deployment, including solar and wind power installations at railway stations, maintenance facilities, and other operational

sites. Financing such initiatives through green financial instruments can contribute to long-term cost savings, reduce dependence on conventional energy sources, and support environmentally sustainable operations.

Additionally, green bond issuance offers Indian Railways an effective means of raising dedicated funds for environmentally sustainable infrastructure projects. Capital raised through green bonds can be directed toward electrification programs, energy-efficient rolling stock, and climate-resilient infrastructure, thereby strengthening the linkage between financial performance and environmental outcomes.

Proposed Green Finance Model for Bharat Railways

To enhance the integration of sustainability within financial planning and investment decisions, the following green finance models are proposed for Indian Railways:

Green Bonds:

Green bonds can be utilized to attract long-term investment for projects that generate clear environmental benefits, such as renewable energy generation, energy-efficient infrastructure development, and low-emission transport systems. These instruments also help broaden the investor base by appealing to sustainability-focused investors.

Sustainability Linked Loans:

Sustainability-linked loans associate borrowing costs with the achievement of specific environmental or sustainability performance targets, such as reductions in carbon emissions or improvements in energy efficiency. Adoption of such financing mechanisms can encourage continuous performance improvements while providing access to cost-effective capital.

Carbon Credit Trading:

Through emission reductions achieved via electrification and renewable energy adoption, Indian Railways can generate carbon credits eligible for trading in carbon markets. The revenue generated from carbon credit trading can be reinvested in additional sustainability initiatives, creating a reinforcing cycle of environmental and financial benefits.

Implication for Sustainable Development

The incorporation of green finance mechanisms allows Indian Railways to align its financial strategies with environmental stewardship and national sustainability priorities. Integrating green finance supports improved operational efficiency, strengthens long-term financial stability, and contributes to broader climate mitigation and sustainable development goals. By leveraging targeted investments and innovative financing models, Indian Railways can reinforce its position as a sustainable mode of transportation while supporting India's transition toward a low-carbon and environmentally responsible economy.

Aligning with Sustainable Development Goals (SDGs)

The integration of Sustainable Development Goals (SDGs) into financial and operational planning has become increasingly important for public sector organizations seeking to balance economic performance with environmental and social responsibility. As a major component of India's transportation infrastructure, Indian Railways holds significant potential to advance multiple SDGs through targeted investments, operational reforms, and sustainable financing mechanisms. Aligning financial strategies with SDG priorities enables Indian Railways to enhance long-term resilience while contributing to national and global sustainability objectives.

SDG7: Affordable and Clean Energy

Indian Railways plays a critical role in advancing SDG 7 through large-scale electrification of railway routes. Electrification reduces dependence on fossil fuels, particularly diesel, and supports the transition toward cleaner and more efficient energy usage. From a financial perspective, electrified routes lower long-term operating costs by improving energy efficiency and reducing fuel expenditure. Additionally, the establishment of renewable power stations, such as solar and wind energy installations at railway stations and operational

facilities, further strengthens the adoption of clean energy. These initiatives contribute to energy security while aligning capital investments with sustainable energy goals.

SDG9: Industry, Innovation, and Infrastructure

Alignment with SDG 9 is reflected in Indian Railways' focus on modernizing infrastructure and adopting advanced technologies. Investments in digital signaling systems, automated operations, and data-driven asset management enhance operational efficiency and service reliability. Smart transportation solutions, including intelligent traffic management and predictive maintenance systems, improve resource utilization and reduce operational disruptions. Financial investments in innovative infrastructure not only support technological advancement but also contribute to the development of resilient and future-ready transportation networks.

SDG11: Sustainable Cities and Communities

Indian Railways contributes to SDG 11 by supporting sustainable urban mobility through integration with urban mass transit systems. Efficient rail-based transportation reduces road congestion, lowers pollution levels, and enhances accessibility within urban and peri-urban areas. Financial and operational strategies that prioritize suburban rail services, metro-rail integration, and last-mile connectivity promote inclusive and sustainable urban development. These initiatives strengthen the role of railways as a backbone of environmentally friendly urban transport.

SDG13: Climate Action

Indian Railways' efforts toward emission reduction directly align with SDG 13, which focuses on combating climate change. Operational measures such as electrification, energy-efficient rolling stock, and optimized logistics contribute to significant reductions in greenhouse gas emissions. Emission-efficient operations, supported by sustainable financing instruments, enhance climate resilience while lowering the environmental footprint of railway services. By integrating climate considerations into financial planning and operational decision-making, Indian Railways supports broader national commitments to climate mitigation and environmental sustainability.

Strategic Implications

Aligning financial and operational strategies with the SDGs enables Indian Railways to achieve a balanced approach to economic efficiency and environmental responsibility. Sustainable investments not only improve operational performance but also strengthen long-term financial stability by reducing energy costs and environmental risks. Through continued alignment with SDG priorities, Indian Railways can reinforce its position as a key driver of sustainable transportation and inclusive economic development in India.

Results and Findings

The analysis of Indian Railways' financial performance, liquidity position, profitability trends, and sustainability initiatives reveals a mixed outcome characterized by strong operational capacity, structural financial constraints, and emerging opportunities for sustainable growth. The findings highlight both the resilience of Indian Railways as a public sector entity and the need for strategic financial and environmental integration.

Current Strength

One of the most significant strengths identified in the analysis is the large operational capacity of Indian Railways. With an extensive network, high passenger and freight volumes, and nationwide connectivity, Indian Railways benefits from economies of scale that support operational continuity and national economic integration. This vast infrastructure base enables the organization to sustain high service levels despite financial and operational pressures.

Another key strength is consistent government support. As a strategically important public utility, Indian Railways receives policy backing, budgetary allocations, and institutional support from the Government of India. This support helps stabilize financial operations, enables capital-intensive investments such as route electrification and infrastructure modernization, and reduces exposure to short-term financial shocks. Government involvement also facilitates access to long-term funding for large-scale development projects.

Challenges

Despite its operational strengths, the results indicate persistent challenges in terms of profitability. Financial ratio analysis shows that profit margins remain relatively low, largely due to high operating costs, social service obligations, regulated fare structures, and cross-subsidization between passenger and freight services. These factors limit the ability of Indian Railways to generate surplus revenue comparable to private-sector transportation entities.

Liquidity pressures also emerge as a critical concern. The liquidity analysis suggests moderate stress in meeting short-term obligations, driven by delayed payments, rising working capital requirements, and mismatches between revenue inflows and expenditure cycles. Such liquidity constraints may affect operational flexibility and limit the capacity to respond quickly to financial contingencies.

Furthermore, the study finds that alignment with green finance mechanisms is currently partial. While Indian Railways has made progress in electrification and renewable energy adoption, the systematic integration of green financial instruments—such as large-scale green bond issuance and sustainability-linked financing—remains limited. This gap restricts the full realization of environmental and financial synergies.

Opportunities

The findings also reveal several strategic opportunities that can enhance both financial performance and sustainability outcomes. One major opportunity lies in the issuance of green bonds to finance environmentally sustainable projects, including renewable energy installations, energy-efficient rolling stock, and climate-resilient infrastructure. Green bonds can attract long-term, cost-effective capital while strengthening the organization's environmental credibility.

Revenue diversification represents another important opportunity. Expanding non-fare revenue streams—such as station redevelopment, logistics services, commercial leasing, and digital services—can reduce dependence on traditional fare-based income and improve overall financial stability.

Additionally, increased investment in sustainable infrastructure offers long-term benefits. Projects focused on energy efficiency, clean technology, and low-carbon transport systems can reduce operating costs, lower environmental risks, and enhance compliance with national and international sustainability commitments. Such investments also position Indian Railways as a key contributor to India's green transition.

Overall Findings

Overall, the results indicate that Indian Railways possesses strong operational foundations and institutional support but faces structural financial challenges that require targeted reforms. Strengthening liquidity management, improving profitability, and fully integrating green finance instruments can significantly enhance long-term sustainability. By leveraging identified opportunities, Indian Railways can align financial performance with environmental responsibility and sustainable development objectives.

Policy Recommendations

Drawing on the outcomes of the financial and sustainability assessment, this study outlines a set of policy recommendations intended to enhance the financial stability, operational effectiveness, and environmental performance of Indian Railways. The proposed measures emphasize the expansion of revenue sources, greater adoption of green financing instruments, improvements in operational efficiency, and the strengthening of sustainability-oriented governance practices.

Diversification of Revenue System

To improve financial resilience, Indian Railways should progressively reduce its dependence on conventional passenger and freight income by broadening its revenue base. Freight pricing policies need to be strategically refined to better reflect market conditions, operational efficiency, and value-added logistics services, while remaining competitive with other modes of transport. A more flexible and rational freight tariff structure can support revenue growth without adversely affecting freight demand.

Additionally, the commercial utilization of railway land and assets around stations offers considerable potential for generating non-fare revenue. Station-area development through transit-oriented projects, retail and commercial leasing, office spaces, and hospitality facilities can create sustainable income flows and improve asset productivity. Supportive policy frameworks and public–private partnership models can play a critical role in accelerating station redevelopment initiatives.

Adoption of Green Financing Mechanisms

Green financing should be embedded as a key element of Indian Railways' long-term financial planning. The issuance of green bonds can facilitate the mobilization of dedicated capital for environmentally sustainable projects, including route electrification, renewable energy deployment, and energy-efficient infrastructure development. Such instruments not only enable access to long-term funding at favorable costs but also promote greater transparency and accountability in environmental investments.

Moreover, Indian Railways should actively pursue climate finance opportunities from multilateral development banks, international financial institutions, and global climate funds. Leveraging these sources can reduce reliance on traditional budgetary allocations while ensuring alignment with national climate policies and international sustainability commitments.

Improvement of Operational Efficiency

Strengthening operational efficiency is vital for enhancing both financial performance and service delivery. The implementation of advanced asset management systems can improve oversight of infrastructure conditions, lifecycle costs, and maintenance planning. A data-driven approach to asset management supports more efficient resource allocation and minimizes unexpected operational expenses.

In parallel, targeted cost optimization initiatives should be undertaken, focusing on energy usage, maintenance efficiency, and administrative processes. Process simplification, increased digitalization, and optimized workforce deployment can contribute to effective cost control while maintaining service quality and safety standards.

Integration of Sustainability Metrics in to Financial Reporting

To reinforce strategic alignment and accountability, sustainability-related indicators should be systematically incorporated into financial reporting frameworks. Linking environmental metrics—such as energy consumption, carbon emissions, and renewable energy utilization—with financial performance indicators can support integrated decision-making and enhance transparency for stakeholders.

The inclusion of sustainability metrics in annual financial disclosures will also enable Indian Railways to monitor progress toward environmental objectives and demonstrate compliance with national sustainability policies and internationally recognized best practices.

Concluding Policy Perspective

The implementation of these policy recommendations can support a balanced development pathway for Indian Railways that integrates financial viability with environmental stewardship. Through revenue diversification, the adoption of green finance, operational efficiency improvements, and strengthened sustainability reporting, Indian Railways can enhance long-term institutional resilience while contributing meaningfully to India's broader sustainable development agenda.

Conclusion

This study has examined the financial performance of Indian Railways through the lenses of efficiency, liquidity, and profitability, while also exploring the role of green finance in supporting sustainable development objectives. The analysis highlights that although Indian Railways operates on a vast scale with strong institutional and government backing, its financial efficiency requires significant improvement. Declining

asset productivity and rising operating costs indicate the need for more effective asset utilization and cost management practices.

The liquidity assessment reveals persistent pressures on short-term financial stability, largely arising from mismatches between revenue inflows and expenditure commitments. Strategic working capital management and timely fund flows are therefore essential to strengthen liquidity and reduce dependence on external support.

Profitability remains constrained despite high operational capacity, primarily due to social service obligations, regulated pricing structures, and cross-subsidization between passenger and freight services. While these responsibilities are integral to Indian Railways' public service mandate, they limit its ability to generate financial surpluses and improve returns on assets and equity.

A key contribution of this study lies in demonstrating that the integration of green finance can simultaneously support financial performance and sustainability objectives. The adoption of green bonds, climate finance, and sustainability-linked instruments enhances alignment with the Sustainable Development Goals, particularly those related to clean energy, resilient infrastructure, sustainable cities, and climate action. Green finance provides Indian Railways with an opportunity to mobilize long-term capital, improve energy efficiency, and reduce environmental impacts without compromising service delivery.

Looking ahead, the future sustainability of Indian Railways depends on its ability to balance financial discipline with social and environmental responsibilities. Strategic reforms focused on operational efficiency, prudent liquidity management, revenue diversification, and expanded use of green finance can strengthen long-term resilience. By embedding sustainability into financial and operational decision-making, Indian Railways can evolve into a financially robust and environmentally responsible transport system, contributing meaningfully to India's economic development and climate commitments.

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