

Overview on Development of Railway Line Network in Nepal Himalaya

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Abstract: The development of the railway network in the Nepal Himalaya marks a transformative phase in the nation's transportation infrastructure, aiming to enhance regional connectivity and trade efficiency between South and East Asia. Nepal's rugged terrain, active tectonics, and seismic vulnerability pose considerable challenges to railway development, yet recent governmental initiatives supported by India, China, and South Korea have advanced both feasibility and construction phases of key routes. This paper presents an overview of Nepal's railway history, major ongoing and proposed projects, and their anticipated socio-economic and environmental benefits. Early railway systems such as the Raxaul–Birgunj–Amlekhgunj line (1927) and the Jayanagar–Janakpur–Bijulpura line (1937) laid the foundation for transboundary connectivity, later revitalized through modern upgrades. Major ongoing projects include the East–West Railway (945 km), Raxaul–Kathmandu (136 km), and Kerung–Kathmandu (170 km) corridors. Feasibility studies and DPRs have been completed for several lines, with estimated budgets ranging from NRs 250 to 400 billion. The paper highlights the use of durable local quartzite and granite for ballast material, alignment with Indian railway standards, and incorporation of modern geotechnical design practices. The positive impacts of railway development include enhanced trade integration, reduced carbon footprint, improved urban mobility, and employment generation. Despite funding and technical challenges, Nepal's long-term vision of a resilient and sustainable trans-Himalayan railway network offers promising potential for national growth and regional cooperation.

Keywords: *Railway development, Nepal Himalaya, Connectivity, Ballast, Trans-Himalayan trade.*

Introduction

The development of railway infrastructure in the Nepal Himalaya represents a transformative opportunity for the nation's connectivity, trade integration, and sustainable development (Chand, 2020). Nepal's challenging topography characterized by active tectonics, rugged terrain, and high seismicity has historically constrained large-scale transportation systems. However, recent national and bilateral efforts between Nepal, India, and China are revitalizing Nepal's long-standing aspiration to establish a functional, trans-Himalayan railway network. This paper provides an overview of the historical evolution, current projects, and potential socio-economic benefits of railway network development in Nepal, emphasizing the

importance of integrating geological and engineering considerations in Himalayan infrastructure.

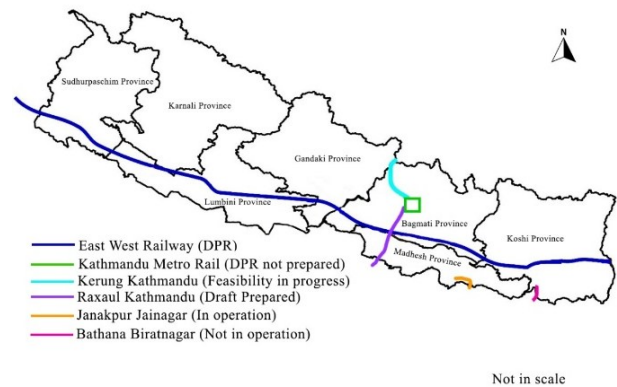


Figure 1, Railway network diagram of Nepal.

History of railway development in Nepal

Nepal's railway history dates back nearly a century. The first line—Raxaul–Birgunj–Amlekhgunj Railway, constructed in 1927 by the British served as a vital cargo and passenger route connecting the Terai plains to the Indian border. In 1937, the Jayanagar–Janakpur–Bijulpura Railway was established, symbolizing Nepal's entry into the regional railway network. Both lines initially used narrow-gauge tracks and were primarily driven by colonial trade interests.

Following their gradual decline during the late 20th century, Nepal entered a prolonged phase without modern railway expansion (GON, 2024). The government recognized the necessity of restoring and upgrading railway connectivity to reduce dependency on costly and environmentally vulnerable road transport. The establishment of the Department of Railways (DoRW) in the early 2000s marked a strategic shift toward integrated transport planning, aligning with regional connectivity initiatives under the Belt and Road Initiative (BRI) and South Asian Association for Regional Cooperation (SAARC) frameworks.

Old to new projects

Current railway development integrates legacy lines with new international and domestic projects. The

Jayanagar–Janakpur–Bijulpura railway (52 km) has been upgraded to broad gauge and is now operational, while the Bathnaha–Biratnagar link (18 km) nears completion. The East–West Railway (945 km), Nepal’s backbone corridor, is under DPR preparation and partial construction with an estimated cost of NRs 300 billion. The Raxaul–Kathmandu (136 km) and Kerung–Kathmandu (170 km) cross-border lines are key international routes under feasibility evaluation, with projected budgets of NRs 250 and 400 billion respectively. Additionally, the Kathmandu Metrorail (27 km) aims to modernize urban mobility through high-capacity mass transit.

Project status and budgets

Among major projects, the Jayanagar–Janakpur–Bijulpura and Bathnaha–Biratnagar lines are completed or operational, adhering to Indian railway standards IRS-GE-1: June 2016 (Research Designs and Standards Organization, 2016). Feasibility and design phases of trans-Himalayan links are progressing through bilateral cooperation. The East–West Railway has achieved land acquisition and preliminary groundwork in multiple sections. International technical and financial collaborations remain vital for high-altitude tunneling and seismic-resistant track designs.

Discussion: positive impacts

Railway expansion in Nepal Himalaya presents substantial socio-economic benefits. Enhanced regional connectivity between India and China positions Nepal as a transit hub for South Asian trade. Rail transport minimizes environmental pollution and dependence on imported fuel, supporting national low-carbon strategies. Construction activities generate extensive employment and stimulate industries such as steel, cement, and quarrying. Urban projects like the Kathmandu Metrorail improve local mobility, reduce congestion, and promote sustainable city planning. Furthermore, the utilization of local quartzite and granite for ballast enhances material self-reliance and cost efficiency while ensuring durability in Himalayan conditions (Wnek et al., 2018; Guo et al., 2022, Sharma and Tamrakar, 2025).

Conclusion

The ongoing expansion of Nepal’s railway network symbolizes a strategic move toward sustainable connectivity and national modernization. Despite technical and financial challenges imposed by complex geology and terrain, the combined use of local resources, international collaboration, and advanced geotechnical engineering offers a pathway for establishing a safe, efficient, and environmentally responsible trans-Himalayan railway system.

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