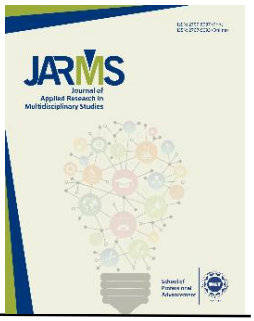
Journal of Applied Research and Multidisciplinary Studies (JARMS)
Volume 4 Issue 2, Fall 2023
ISSN(P): 2707-5087, ISSN(E): 2707-5095
Homepage: https://journals.umt.edu.pk/index.php/jarms

Article QR



Title: **Overview of Pakistan's Transportation Infrastructure from Future Perspective: A Systematic Literature Review**

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DOI: https://doi.org/10.32350/jarms.42.01

History: Received: June 17, 2023, Revised: August 27, 2023, Accepted: November 16, 2023, Published: December 30, 2023

Citation: Aziz, M. S., Khan, M. R., Mehmood, S., & Baig, A. U. (2023). Overview of Pakistan's transportation infrastructure from future perspective: A systematic literature review. *Journal of Applied Research and Multidisciplinary Studies*, *4*(2), 00–00. https://doi.org/10.32350/jarms.42.01

Conflict of Interest: Author(s) declared no conflict of interest

A publication of
School of Professional Advancements
University of Management and Technology, Lahore, Pakistan

Overview of Pakistan's Transportation Infrastructure from Future Perspective: A Systematic Literature Review

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Abstract

Economic growth has emerged as the most influential tool in the recent years and an efficient transport infrastructure is one of the key factors to achieve economic development. Furthermore, the integration of advanced technological trends may accelerate the economic activities. However, the same has not been widely discussed in the Pakistani context so far. Therefore, the current study aimed to analyze the existing situation, difficulties, and future prospects for transport infrastructure development in Pakistan. The study investigated significant issues pertaining to the condition of roads, railways, airports, and ports as well as future trends and recommendations along with strategies for sustainable and efficient infrastructure. A systematic literature review was conducted to identify the current state and key opportunities for the development of Pakistan's transportation infrastructure from future perspective. Findings showed that securing funds, increasing governance and institutional capacity, tackling urban congestion, limiting environmental impacts, and assuring infrastructure maintenance are all difficult tasks. However, the analysis offered opportunities arising from Pakistan's strategic location, prospects for regional integration, public-private partnerships, technical breakthroughs, tourism, and economic growth. Strategies and recommendations were also provided for policymakers and key stakeholders. Implications concentrated on evaluating active initiatives, conducting region-specific analyses, analyzing the impact, developing creative financing approaches, and integrating the emerging technologies. Pakistan may foster a robust and sustainable transport infrastructure by tackling issues and capitalizing on opportunities, hence boosting economic growth, connectivity, and overall development.[1]

***Keywords*:** development opportunities, key challenges, transportation infrastructure

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Introduction

Transportation infrastructure development and modernization play a critical role in molding a nation's progress. Moreover, it also supports economic growth and improves the inhabitants' quality of life. Pakistan, a country rich in cultural heritage and different landscapes, is on the verge of an exciting transportation development (Wang et al., 2019). Pakistan has also launched a quest to revolutionize its transport systems, both within and outside its borders by utilizing its advantageous geographical location and recognizing the need for solid infrastructural networks. In recent years, Pakistan has greatly progressed in the field of transportation including road networks, railways, air travel, and maritime connectivity. Government's commitment to infrastructure development, smart collaborations, and investments from national and international stakeholders drive this success. These efforts have attempted to address essential challenges, such as traffic congestion, safety concerns, connectivity gaps, and aging infrastructure while fostering a favorable environment for economic growth and regional integration (Mohmand et al., 2017).

Pakistan has been investing to expand and improve its road network in order to boost connectivity. It includes building new highways, motorways, and thoroughfares to connect key cities and regions (Shahid et al., 2022). To enable economic growth and enhance transportation efficiency, government may continue prioritizing road infrastructure construction. With the help of this investment in infrastructure, the government of Pakistan may enable forces that boost economic growth. Additionally, the road infrastructure also helps to capture the tourism sector. In recent years, economic corridors have appeared as significant tools for regional connectivity, cooperation, and growth in a globalized world. The China-Pakistan Economic Corridor (CPEC) is expected to further strengthen the connectivity, trade, and economic cooperation between the two countries. Chinese Premier Li Keqiang emphasized the construction of CPEC during his May 2013 visit to Pakistan (Irshad, 2015). The purpose of CPEC is to connect Kashgar in China's Xinjiang Uygur Autonomous Region with the southwestern Pakistani port of Gwadar. CPEC is not only boosting the trade and economic growth of both countries, however, it is also helping Pakistan to improve its transportation infrastructure. CPEC has a considerable impact on

Pakistan's transportation infrastructure (Khan et al., 2023). The construction of mass transit projects, motorways, and development of Gwadar port are some of the government initiatives against regional connectivity and promotion of Pakistan's transportation infrastructure.

Road and transport infrastructure provides an easy access to tourism destinations and it also increases business activities in the region that may have a positive impact on local community's standard of living. Scholars have suggested that road and transport infrastructure not only plays a vital role in enhancing the existing tourism activities, however, it also promotes the development of new tourism sites in the region (Kanwal et al., 2020). A recent study has suggested that road and transport infrastructure in a country attracts tourists and can promote tourism destinations (Virkar & Mallya, 2018). Indeed, past research has shown a positive relationship between road infrastructure and tourist activities which increases the flow of tourism development. Literature from Pakistani perspective in the field of transport infrastructure and its role in the economic development, has not been studied with rigor. However, the global and regional economic outlook has provided strong evidences of transportation role in the economic development. Therefore, Pakistan needs stronger efforts to keep itself alive in the region through efficient regional and global connectivity.

Furthermore, the integration of latest technological trends and methods in transportation sector is negligible that retarded the efficiency and sustainable performance of this sector (Hashim et al., 2023; Javed et al., 2023; Khan et al., 2023; Khan et al., 2022). Additionally, the construction and development of ports is also important for land and railway transportation. The existing infrastructure of ports in Pakistan is not supportive to the upcoming vast vessels and their features. The enhancement, improvement, and new addition of ports in coastal areas is critically required for Pakistan to accommodate the regional trade. Hence, there is a dire need to focus this particular field to become more sustainable and competitive in the region. Therefore, the current study aimed to provide a complete overview of Pakistan's transport infrastructure in the future. Moreover, it also shed light on improvements and strategic initiatives implemented between the years 2015 and 2022. Furthermore, the current study also examined the important milestones attained, problems faced, and transformative projects that have prepared the way for a modern, efficient, and sustainable transport system in

Pakistan, drawing on an exhaustive study of previous works. In this regard, the following research questions and research objectives were formulated.

Research Questions

Q1: What is the current state of Pakistan's transportation infrastructure?

Q2: What are the anticipated future trends and developments in Pakistan's transportation infrastructure?

Q3: What are the key challenges faced by Pakistan in improving its transportation infrastructure?

Q 4 What are the opportunities exist for addressing these challenges?

Q 5: What strategies can be proposed to enhance the sustainability and efficiency of Pakistan's transportation infrastructure?

Based on the research questions, following research objectives were formulated

Research Objectives

RO 1. To assess the current state of Pakistan's transportation infrastructure.

RO 2. To analyze the anticipated future trends and developments in Pakistan's transportation infrastructure.

RO 3. To identify the key challenges and opportunities for the improvement of Pakistan's transportation infrastructure.

RO 4. To propose strategies and recommendations for future development of Pakistan's transportation infrastructure, focusing on sustainability and efficiency.

The rest of the study has been divided into sections, for instance section 2 discussed methodology and inclusion/exclusion criteria. Section 3 was based on a discussion on research objectives. Moreover, the study also discussed potential recommendations and opportunities to adopt a sustainable transportation system in Pakistan. The last section of the study presented the conclusions.

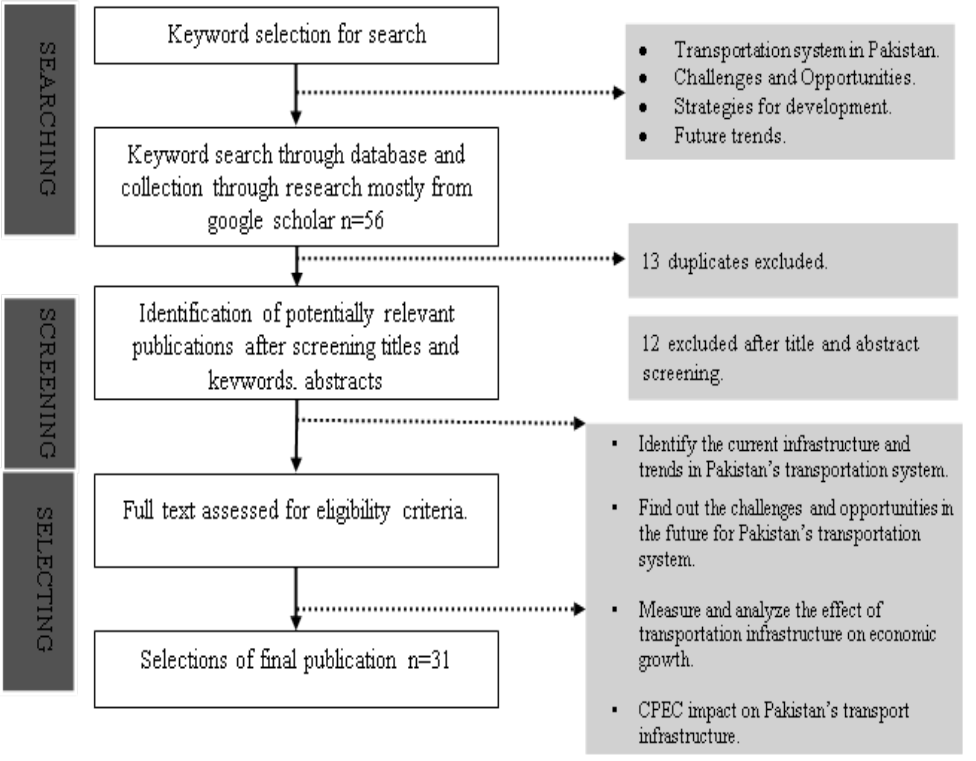
Research Methodology

Initial Selection Criteria of Selected Articles

The databases of Google Scholar, Scopus, Web of Science (WOS), ScienceDirect, and famous SCM journals were used for the initial search. The customized search option between 2015-2022 was adopted. This time period was selected because major transportation developments were witnessed during this particular time period and major transformations in Pakistan's transportation system took place in this period as well. The keywords used in the current study included "transportation system in Pakistan," "key challenges and opportunities," "strategies for development," and trends in transportation system". Only the published peer-reviewed scientific and impact factor journals, conference proceedings, and opinion papers were selected.

Figure 1

Selection Criteria



Content Screening and Complementary Search

For content screening, a clear and broad definition of transportation infrastructure in Pakistan, analysis of trends of transportation in Pakistan, and key challenges and opportunities for the development of infrastructure in Pakistan were selected to identify and include the relevant articles. Initially, the researches' keywords, titles, abstracts, and findings were reviewed for inclusion criteria. Moreover, the main body of the articles was also studied during the inclusion. Studies that discussed transportation infrastructure and transportation trends in Pakistan including the aspect of sustainability were selected. On the other hand, the researches that did not correctly define the transportation trends and infrastructure of transportation were excluded. Through this criterion, 31 articles were successfully obtained for final review. The summary of finalized articles is shown in Table 1.

Discussion

RO1: To assess or analyze the current state of Pakistan's transportation infrastructure, authors went through different past papers published between the years 2015 and 2022. Pakistan's transportation infrastructure consists of roads, railways, airports, and ports. Pakistan has a well-developed road system that connects major cities, towns, and rural areas. However, road quality might vary considerably. Major highways, such as the M1, M2, and M3 have been built up to high standards for the easy flow of traffic between major cities. During the recent years, government has prioritized road infrastructure improvements and construction of new highways to improve the connectivity (Mohmand et al., 2021). The state-owned Pakistan Railways operate the country's railway system. This network connects key cities and covers a large area of the country. Limited investment, maintenance concerns, and antiquated equipment have hampered the railway system altogether. Efforts have been undertaken to update the system, maintenance of rails, addition of modern locomotives, and the improvement of passenger services (Kanwal et al., 2020). Pakistan has several airports, the busiest of which are Jinnah International Airport in Karachi and Allama Iqbal International Airport in Lahore. These airports handle both domestic and international flights and have witnessed recent additions and enhancements as well. Smaller airports, for instance Gilgit and Gwadar airport also manage regional and domestic traffic (Khan & Khan, 2020).

Pakistan has two large ports situated in Karachi, that is, Karachi Port and Port Qasim. These ports are vital to international trade and handle a large volume of goods. The government has been trying to improve the infrastructure of these ports to increase handling capacity in order to meet rising trade needs (Ali et al., 2017). Pakistani government has prioritized the building of transport infrastructure in recent years. Projects, such as CPEC have strengthened the communication and trade routes between Pakistan and China by building new roads, trains, and energy infrastructure. It includes many projects, such as the Karachi-Peshawar motorway, KKH Phase II, and other BRT and orange line projects (Alam et al., 2019). The studies presented in Table explain the current structure of Pakistan's transportation system and also points out the possible changes or opportunities for development. The synthesis of these studies provides adequate knowledge to achieve the research objectives, especially objective 1.

RO2: Pakistan has been investing to expand and improve its road network to boost global and regional connectivity. It includes the construction of new highways, motorways, and thoroughfares to connect key cities and regions. To enable economic growth and enhance transportation efficiency, government may continue to prioritize road infrastructure construction (Kanwal et al., 2020). To alleviate urban congestion and improve public transportation, major cities, such as Karachi, Lahore, Faisalabad, and Islamabad have attempted to create and expand mass transit networks. Projects, such as the Karachi Circular Railway and Lahore Metro Bus System have already been initiated and further investments in urban mass transit systems are also possible in the near future (Nadeem et al., 2021). The project's first phase, that is, a 27-kilometer route with 26 stations was introduced in the year 2023. Additionally, government has also declared its intentions to construct a new metro line in Karachi. The 26-kilometer-long route with 25 stops is expected to be finished in 2025.

Government has also paid considerable attention on CPEC development. The corridor is featured with a network of highways, trains, and pipelines connecting China and Pakistan. The project's first phase, that is, the construction of a road and train link was completed in the year 2023 (Abid & Ashfaq, 2015).The government is also intending to introduce innovative transportation technologies, such as electric automobiles and

self-driving cars. These technologies are pollution free while also enhancing security and safety. Moreover, some electric vehicles were also witnessed at the start of 2023. Government initiated public service buses including Audi's SUV launched in 2022 (Sohail et al., 2021). KIA motors have already manufactured an electric car, however, due to political instability these electric cars are yet to be launched in market. This would be a game-changing move by KIA because they are well-renowned for their low-price products. If they launched this new electric car at a reasonable price, then this would change the future of Pakistan's motor industry. Pakistan Railways has been attempting to modernize and upgrade its railway infrastructure to address maintenance difficulties. This could include the rehabilitation of existing rails, introduction of new locomotives, improvement of passenger services, and an attempt to boost the speed and efficiency of rail transportation (Rehman et al., 2018). There have been debates to implement high-speed rail projects in Pakistan as in other countries in the region. These initiatives attempted to provide travelers with faster and more effective transport options between major cities. Lastly, the induction of mass transit transport system in Karachi has introduced some of the eco-friendly buses including purely electric buses that minimize traffic congestion and environmental hazardous.

Table 1

Finalized Articles

Author	Application related to Pakistan Transport Infrastructure	Findings
Mohmand et al. (2021)	The current study investigated the causal relationship between economic growth, transport infrastructure, transport sector fuel consumption, and carbon emissions from transport in Pakistan.	The results also showed that, in the long run, a bidirectional relationship exists between economic growth and infrastructure.
Rasool et al. (2019)	The study assessed the impact of oil prices, energy intensity in transport sector, road infrastructure, economic growth, and population density on the transport sector's CO2 emissions in Pakistan.	The study recommended investment in renewable energy projects and energy-efficient transport systems (for instance light trains, rapid transport systems, and electric buses).
Nadeem et al. (2021)	Performance of BRT system in Multan, Pakistan is based on the passengers' perceptions and BRT standard scorecard.	This research concluded that around 54% of passengers are highly satisfied and opted for BRT due to comfort.
Lee et al. (2021)	The study aimed to explore the public behavioral intentions to purchase EVs in an area with an early stage of EV induction, that is, Lahore, Pakistan.	About 60% of the respondents showed their willingness to purchase EVs in the future.
Yaqoob et al. (2021)	An economic comparison was carried out for gasoline, diesel, CNG, LPG, and alternative fuels based on fuel properties, consumption, availability, performance, and gas emission.	Pakistan should move towards electric vehicles, as the world trend is inclined toward efficient vehicles.

Author	Application related to Pakistan Transport Infrastructure	Findings
Abdullah et al. (2021)	The primary objective of this study was to explore passengers' satisfaction with app-based DRT services in Lahore, namely SWVL and Airlift.	Service attributes indicated a larger positive impact on overall satisfaction with choice as compared to the ambiance. Although, the ordinal model for choice B fitted the data well, the predictors were found to be insignificant.
Guerrero-Ibáñez et al. (2018)	The integration of sensor technology with transportation infrastructure to achieve a sustainable Intelligent Transportation System (ITS).	There are challenges that sensor technologies need to address in the future to achieve a fully operational, non-intrusive, cooperative ITS environment.
Galus et al. (2012)	The current study described the development of an integrated method for electric mobility assessment, combined the power system models, agent-based transport simulations, and modeling of specific vehicle technologies.	The paper presented an integrated method that can assess the impact of electric mobility on the domains of power and transportation systems as well as the environment.
Awan et al. (2022)	The study investigated the nexus between transport sector-based carbon dioxide emissions, economic growth, innovation, and urbanization.	Results showed that urbanization upsurges, while innovation mitigates transport-based carbon dioxide emissions.

Author	Application related to Pakistan Transport Infrastructure	Findings
Shahid et al. (2022)	This study used the transport sector of Pakistan as a case study and provided an economic evaluation of different scenarios for sustainable transportation in the region.	It was concluded that by 2040, the HVS and ECS would reduce carbon dioxide emissions by 303.7 and 213.3 million metric tons respectively as compared to BAUS.
Ali et al. (2018)	The current study attempted to analyze the importance of Indian factor in CPEC and also addressed whether the Indian factor is a threat to CPEC or not.	The states that perform excellently in commercial, trade domains, and industrial sectors would have larger impact on other countries than those having larger armed forces.
Mohmand et al. (2017)	The study employed a panel of data using the unit root, co-integration, and Granger Causality (GC) model to test whether causal linkages between economic growth and transportation infrastructure exist at national and provincial levels.	The findings suggest that in the short run, there would be no causality between the two variables at national level, however, a unidirectional causality from economic development to infrastructure investment would exist in the long run.
Kanwal et al. (2020)	This study investigated the impact of road and transportation infrastructure on community support for tourism in the context of CPEC.	Results revealed that the perceived impact of CPEC road and transport infrastructure is positively related to community support for tourism.

Author	Application related to Pakistan Transport Infrastructure	Findings
Asghar et al. (2021)	This study provided a detailed overview of ongoing EVs maturation and addressed some of the main adaptation challenges and opportunities in Pakistan.	The review shows that state financial subsidies, market prices, technical malignancy, and social drawbacks are some of the most significant obstacles for EVs to join the current market.
Sohail et al. (2021)	This study aimed to inspect the asymmetric impact of air-railway transportation on environmental pollution in Pakistan.	The outcomes confirmed short-and long-run asymmetries in World statistics.
Raza and Lin, (2020)	LMDI technique was applied to detect the influencing variables (that is, carbon coefficient, fuel consumption, total energy consumption, and turnover economy) which oversee CO2 emissions.	The outcomes showed that CO2 coefficient effect is the factor that is decreasing CO2 emissions, while the economic growth effect is the factor that grows CO2 emissions.
Wang et al. (2019)	The study investigated the effect of urbanization on road sector energy consumption controlling for economic growth, road infrastructure, and industrialization.	The results disclosed a significant positive contribution of urbanization to road sector energy consumption.
Alam et al. (2021)	The transport sector affects all aspects of human life including education, research, entertainment, trade manufacturing, culture, and defense.	Investment in construction and maintenance of transport infrastructure, such as roads, rails, and airways are significant elements of gross domestic product (GDP).

Author	Application related to Pakistan Transport Infrastructure	Findings
Batool and Goldmann (2021)	Pakistan is currently faced with huge investments in transport infrastructure in the context of CPEC which is a part of China's Belt and Road Initiative.	It is more economically rewarding for Pakistan to establish a good investment environment for private companies instead of relying on public funds, at least if public infrastructure provision does not improve in future.
Khan and Khan (2021)	The current study provided an empirical analysis of rail freight transport demand in Pakistan using annual time series data from 1972 to 2017.	The improvement in most of this period was due to the development projects implemented by PR to improve its services.
Alam et al. (2019)	The main purpose of this research was to compare the transport cost and travel time between the existing route and the new CPEC route.	Results showed that China can save 71 billion dollars on all the imports and exports that it made from different selected countries.
Wen et al. (2019)	By constructing a new Route Utility Function considering cost, environmental impact, mode reliability and security, transit time, and infrastructure reliability, the remarkable advantages of the corridors were demonstrated over traditional ocean route and their heterogeneous impacts on different regions of China.	These suggested strategies are believed to not only help enlarge the impact of BRI but also benefit the economic development of the involved regions which could stimulate more future research on the BRI.

Author	Application related to Pakistan Transport Infrastructure	Findings
Sodhro et al. (2019)	Furthermore, edge computing can be used to support high mobility/speed (that is, 60-120km/h) with flexible, and scalable multimedia platforms by transmitting large data rates over high bandwidth at anytime and anywhere.	To address this challenge, a joint power and bandwidth management approach should be developed by considering the dynamic nature of vehicular multimedia networks to develop a specific QoS architecture over the edge computing network platform.
Lee et al. (2018)	The 'Silk Road Economic Belt and the 21st-Century Maritime Silk Road' (collectively known as Belt and Road, B&R) has been initiated by the Chinese government in 2013.	To identify the expected impacts of B&R on trade and implications on structural changes in transportation systems, port networks, and international logistics.
Ahmed and Mustafa (2016)	The formation of regional and global strategic movements around the world in the present century has led to geo-strategic and geo-economical partnerships among countries.	The current study determined the impact of the development of infrastructure on growth of agriculture sector.
Irshad (2015)	The current study discussed economic cooperation between China and Pakistan with Chinese investment in Pakistani infrastructural growth.	CPEC, China should not bound it to bilateral relations, however, mull it over with a regional and comprehensive vision.

Author	Application related to Pakistan Transport Infrastructure	Findings
Ali et al. (2017)	This case study investigated the perceived influence of CPEC on Pakistani educational sector.	The study also provided useful guidelines for CPEC practitioners and researchers.
Wang and Yau (2018)	This study is a new attempt to apply the Actor-Network Theory (ANT) as a qualitative analytical framework to examine the possible roles played by multilateral platforms in facilitating cross-border transport infrastructural projects at regional/continental scale.	It was observed that B&R Initiative, as the OPP, can be one of the determinants of mega transport infrastructure development at regional/continental scale.
Abid and Ashfaq (2015)	This corridor would incorporate 2,000-kilometer transport link between Kashgar in northwestern China to Pakistan's Gwadar port on Arabian Sea near the border with Iran via roads, railways, and pipelines.	This study also helped to analyze the challenges and benefits for Pakistan associated with the implementation of China-Pakistan Economic Corridor.
Rehman et al. (2018)	The objectives of the study included the measurement of efficiency in trade and transport through CPEC and to ascertain efficiency in trade and economic development through developed transport infrastructures.	In the same way, a significant association was found between CPEC and an increase in the geographical size of the labor market.
Ali et al. (2018)	The main purpose of the current study was to conduct an in-depth analysis of residents' attitudes toward road and transport infrastructure (China–Pakistan economic corridor, CPEC) and wider economic, social, cultural, and environmental impact on local people.	The results discovered that road infrastructure has significant socio-economic and cultural impacts that significantly affect local people's support for CPEC development.

RO3: Pakistan is currently facing several significant difficulties as well as opportunities to improve its transport infrastructure. These elements have a substantial impact on the country's economic growth, connectivity, and overall development. After the synthesis of studies, some of the most important difficulties and opportunities were pointed out. Pakistan's road network is inadequate and frequently crowded, particularly in urban areas. Many current roads are in deteriorated conditions, resulting in delays, accidents, and increased transportation expenses. Efficient and dependable public transportation is scarce in many sections of the country. This increases reliance on private vehicles, aggravating traffic congestion and pollution. Integration of various modes of transportation, such as trains, ports, and airports is critical for the efficient flow of products and people. However, due to lack of adequate intermodal connectivity, Pakistan's logistics and trade facilitation are suboptimal (Batool & Goldmann, 2021).

Pakistan's railway infrastructure requires modernization and development. Many train lines are obsolete, resulting in slower speeds and less capacity. Improvements in rail network could benefit both freight transportation and passenger services (Abid & Ashfaq, 2015). While Pakistan has made strides to strengthen its aviation industry, there is still a need to increase air connectivity within the country and airport infrastructure to meet growing passenger and cargo traffic. CPEC is a major project of BRI that intends to connect Pakistan's Gwadar Port to China's northwestern area. It provides a potential for considerable infrastructure development including road networks, trains, and energy projects which would improve regional connectivity and trade (Batool & Goldmann, 2021). By leveraging PPPs, transportation infrastructure projects can attract private investment. Collaborations between government and private sector may assist in overcoming financial restrictions and promoting effective infrastructure development (Abid & Ashfaq, 2015).

Integration of digital solutions and intelligent transportation systems can improve traffic management, increase road safety, and provide commuters with real-time information. Transportation networks may be optimized by implementing technologies, such as smart traffic lights, GPS tracking, and mobile applications (Awan et al., 2022; Khan & Manzoor, 2021). Pakistan might investigate the potential for greater regional

connectivity with neighboring nations, such as Iran, Afghanistan, and India. Improved transport linkages can encourage trade, tourism, and economic integration. Improving port infrastructure, such as Gwadar Port and trade facilitation measures would strengthen Pakistan's status as a regional trading hub which may attract investment and support economic growth. Addressing these difficulties and capitalizing on potential opportunities would pave the way for a more efficient, linked, and sustainable transport infrastructure in Pakistan, contributing to economic development and improving inhabitants' quality of life (Ali et al., 2018).

RO4: Several techniques and ideas might be considered to ensure a long-term and effective development of Pakistan's transport infrastructure. After synthesizing the studies, some of the essential areas were extracted. Firstly, the adoption of an integrated approach to transportation planning that considers diverse means of transportation, such as road, rail, air, and waterways. This strategy is helpful in the optimization of infrastructure investments and promotion of seamless connections (Wang et al., 2019). Secondly, implementation of sustainable urban design practices that prioritize public transportation, pedestrian-friendly infrastructure, and non-motorized transportation options including cycling and walking could serve better. This strategy has the potential to minimize traffic congestion, air pollution, and energy usage. Thirdly, the improvement and extension of public transport systems, particularly in metropolitan areas, by enhancing bus and rail network quality and coverage. This could provide effective and inexpensive transportation options, prioritize the development of mass transit systems, such as metro lines and BRT systems (Batool & Goldmann, 2021). Fourthly, the development of infrastructure and policies that favor non-motorized transportation, such as bike lanes, pedestrian-friendly sidewalks, and bike-sharing programs. This can minimize reliance on motorized vehicles for short excursions while also improving air quality and lowering traffic congestion (Shahid et al., 2022).

Furthermore, modernization and expansion of rail network is required to support both passengers and freight operations. Efficient systems may assist to minimize traffic congestion and carbon emissions along with the improvement of intercity connectivity (Rehman et al., 2018). The encouragement of using renewable energy sources is also an important factor for the electrification of transportation infrastructure, such as solar or wind power. This involves promoting the use of EVs and establishing a

reliable charging infrastructure network (Asghar et al., 2021). Increase intermodal connectivity by efficiently integrating multiple modes of transportation. Create efficient freight routes, intermodal hubs, and logistics centers to allow for smooth movement of goods while lowering transportation costs (Alam et al., 2019). Lastly, create and implement transportation standards that promote safety, environmental preservation, and efficiency. This covers pollution requirements for vehicles, road safety laws, and fines for noncompliance. Overall, for the future development of Pakistan's transport infrastructure, a comprehensive approach that prioritizes sustainability, efficiency, and multimodal connectivity is critical. Collaboration across government agencies, private-sector partners, and general public is required for these plans and proposals to be implemented successfully.

Conclusion

In this systematic literature review, different articles were studied to identify the challenges and opportunities for the development of Pakistan's transportation infrastructure. The synthesis identified that Pakistan's transport infrastructure poses both difficulties and opportunities for sustainable and effective growth. The review of critical concerns concerning Pakistan's transport infrastructure emphasized the importance of ongoing efforts in funding and financing, governance and institutional capacity, urban congestion management, environmental effect mitigation, and infrastructure maintenance. However, findings highlighted the country's strategic location, chances for regional integration, the potential for public-private partnerships, technical breakthroughs, tourism, and economic growth to provide opportunities for advancement. Future avenues must be addressed including the analysis of ongoing programs, conducting region-specific analyses, assessing impact, developing creative financing strategies, and integrating emerging technology. By tackling these issues and seizing possibilities, Pakistan may pave the path for a stronger and more sustainable transport infrastructure, fostering economic growth, connectivity, and overall development. Such endeavors necessitate stakeholder collaboration, data-driven decision-making, and a long-term vision for a thriving future.

Pakistan can improve the sustainability and effectiveness of its transport infrastructure by addressing the difficulties mentioned in the

study. This would assist the economy, connectivity, and overall development.

Practical Implications and Future Research Directions

Policymakers and stakeholders in Pakistan can obtain an understanding of major problems and opportunities in transport infrastructure development with the help of implications mentioned in this study. These implications are helpful for them to make better decisions by deploying resources more effectively. The findings are also helpful to establish policies and initiatives in order to improve the sustainability and efficiency of transport infrastructure. Furthermore, the results emphasized the importance of ongoing study and monitoring of infrastructure projects to evaluate their development, impact, and efficacy. This may help with evidence-based decision-making and guarantee that infrastructure development is in line with the country's changing demands.

Furthermore, the current research may delve into specific needs and challenges of various regions within Pakistan, considering their distinct traits and expectations, to adjust infrastructure development plans accordingly. Exploration of social, economic, and environmental repercussions of transportation infrastructure projects and development of measures to avoid potential negative consequences may also be beneficial. Furthermore, research might also dive into novel financing mechanisms, such as the potential of green bonds or public-private partnerships, to circumvent funding constraints.

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