

## ORIGINAL RESEARCH ARTICLE

# Exploring stakeholder perspectives on barriers to green financing in Pakistan's transportation sector

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**Abstract:** Green finance plays a key role in closing the funding gap for sustainable development and environmental initiatives. In Pakistan, the transport sector contributes over 43% of emissions, causing significant air pollution and public health risks in urban areas. While projects like Karachi's Green Bus Rapid Transit (BRT) aim to address these issues, the implementation of green financing remains limited due to weak financial incentives, institutional gaps, and low stakeholder engagement. Despite the National EV Policy's target of 30% electric vehicle penetration by 2030, adoption remains below 1%. This study investigates how green financing can enable sustainable transportation in Pakistan by identifying regulatory, financial, and institutional challenges and opportunities. It analyzes mechanisms such as green bonds, public-private partnerships, and climate funds to assess their potential in addressing barriers to low-carbon mobility. Key challenges identified include the lack of a structured green finance framework, restricted access to international climate finance, and misaligned policies. The research employs thematic analysis, policy matrix evaluations, and meta-analysis to assess financial viability and policy effectiveness. Drawing on stakeholder interviews and a review of national strategies and global best practices, findings emphasize the urgent need for a national green finance strategy, improved climate finance access, and coordinated policy action. Advancing sustainable transport – through EV scale-up, BRT expansion, and clean mobility – demands collaboration across government bodies, financial institutions, and the private sector to build a supportive financial ecosystem, reduce urban air pollution, and align with Pakistan's climate goals.

**Keywords:** Green financing; Sustainable transportation; Electric vehicles; Climate finance; Public-private partnerships

## 1. Introduction

Green finance plays a crucial role in bridging the financing gap for sustainable development and facilitating the implementation of environmental

projects.<sup>1</sup> The mobilization of public and private capital for financing projects that result in positive environmental outcomes as well as financial returns is considered green finance.<sup>2</sup> Efforts toward developing green finance initiatives are ongoing, with governments,

international organizations, and financial institutions advancing sustainable investment recommendations.<sup>3</sup> In Pakistan, the transport sector poses considerable health and economic challenges. Green Bus Rapid Transit (BRT) Karachi project (FP085, 2018) addresses these issues, as traffic congestion in Karachi costs the economy approximately 2.3 billion USD annually and results in 1.5 billion man-hours.<sup>4</sup> The transport sector accounts for over 43% of emissions, contributing substantially to Pakistan's total air pollution and deteriorating air quality and public health.<sup>5</sup> Research indicates that daily vehicle-related air pollution in major cities costs around 1 million USD in health-related expenses and lost productivity, resources that could otherwise be invested in developing a greener, healthier future.<sup>6</sup> Despite increasing awareness, challenges in implementing green financing mechanisms persist. Researchers have investigated Pakistan's broader green finance policy and regulatory landscape. For example, Kumar *et al.*<sup>7</sup> compared the existing policy framework and identified key gaps. Recommendations for strengthening green finance include developing a comprehensive green finance taxonomy, enhancing green financial literacy, and providing clearly defined guidelines for green bond issuance. Moreover, scholars have emphasized the need for capacity within financial institutions and regulatory bodies to support green finance policy implementation and promote sustainability in financial practices.<sup>8</sup>

Pakistan's transportation sector is a major contributor to environmental pollution, poor air quality, and greenhouse gas emissions. According to the Pakistan Economic Survey 2022 – 2023, the sector is responsible for more than 43% of the country's total air pollution. Cities such as Lahore and Karachi consistently rank among the most polluted in the world. A 2020 World Bank report estimates that Pakistan's gross domestic product suffers due to lost productivity.<sup>9</sup> Although there is growing urgency to adopt sustainable transport solutions (such as electric vehicles [EVs], low-emission public transport systems, and renewable energy-powered infrastructure),<sup>10</sup> their implementation remains inadequate. One of the key obstacles is the limited availability of green financing to support such initiatives. While global green finance flows reached 1.1 trillion USD in 2022, according to a 2023 publication by the Climate Policy Initiative, Pakistan's green financing mechanisms remain underdeveloped and poorly integrated into the transportation sector.<sup>11</sup> Although there are financial supports such as subsidies, loans, and tax incentives for sustainable transport, these

either do not meet the requirements for low-carbon infrastructure and vehicle adoption or are inaccessible to most users.<sup>12</sup> For example, Pakistan introduced its National EV Policy in 2020, aiming to achieve 30% EV penetration by 2030. However, the lack of dedicated green financing has hindered progress. As of 2023, <1% of registered vehicles in Pakistan are electric, according to the Ministry of Climate Change. With over 32 million registered vehicles nationwide, this percentage equates to fewer than 300,000 EVs. Despite the EV policy's ambitious targets, adoption remains extremely limited, indicating the gap in financing and infrastructure support.<sup>13</sup> This financing gap is further exacerbated by regulatory barriers, low stakeholder awareness, and limited participation from financial institutions and private investors.<sup>14</sup> These challenges undermine the development and adoption of sustainable transport solutions.<sup>15</sup> This research aims to explore how green financing can facilitate the sustainability of transportation in Pakistan. It addresses financial, regulatory, and institutional barriers that constrain the extensive use of green finance mechanisms and examines the possibility of using innovative financial instruments, including green bonds, climate funds, and public-private partnerships (PPPs), to facilitate the transition toward low-carbon transport systems.<sup>16</sup> Ultimately, this study seeks to assess the effects of green finance on sustainable transportation in Pakistan while identifying both the challenges and opportunities associated with its implementation.

## 2. Literature review

The financial sector implements green financing as an investment method that facilitates projects and ventures promoting environmental sustainability. Green financing supports sustainable endeavors in renewable energy, energy efficiency, waste management, sustainable agriculture, and other sectors that reduce carbon emissions and protect the environment. Various financial instruments constitute green financing, including green bonds, loans, equity investments, and impact investing, all aimed at promoting environmental protection and building climate resilience.<sup>17</sup> Financial institutions incorporate environmental, social, and governance factors into decision-making to align financial activities with Sustainable Development Goals (SDGs).<sup>18</sup> Growing global environmental problems require green financing as an essential mechanism for supporting low-carbon economy transitions and advancing sustainable development.

Green financing is a crucial tool for achieving global sustainability targets, particularly SDG 13 (climate action). It enables governments, businesses, and financial institutions to allocate funds to projects that reduce environmental risks while ensuring long-term ecological stability.<sup>19</sup> Developing economies rely on green financing to address air and water pollution, mitigate climate change effects, and manage resource depletion, while also fostering sustainable employment and technological advancements.<sup>20</sup> Pakistan's high vulnerability to climate change has intensified the focus on green financing as a solution. The National Climate Change Policy and the Pakistan Climate Change Act highlight its role in mitigating environmental risks. However, low awareness of sustainable project opportunities and limited access to institutional funding continue to hinder sectoral growth.<sup>21</sup> The Pakistan Stock Exchange (PSX) has introduced green bonds, and commercial banks have launched sustainable financing options, but Pakistan's green finance sector remains in its infancy compared to other developing nations.<sup>22</sup> While the National Climate Change Policy (2012) and the Climate Change Act (2017) establish foundational commitments to low-carbon development, their implementation remains limited.<sup>23</sup> According to the United Nations Development Program 2023 and the Pakistan Institute of Development Economics, these policies suffer from weak enforcement mechanisms, inadequate inter-ministerial coordination, and a lack of localized action plans.<sup>24</sup> For instance, although the policy promotes sustainable transport, it lacks binding financial instruments and specific timelines. Moreover, provincial governments have not uniformly adopted or adapted the National Climate Change Policy objectives, resulting in implementation gaps in urban transportation planning and EV financing strategies. Several Pakistan-based studies have highlighted the fragmented state of green finance. For example, Goodwin<sup>25</sup> found that green financing in Pakistan is largely donor-driven, with minimal private-sector leadership. A 2023 report by the State Bank of Pakistan (SBP) revealed that fewer than 5% of financial institutions have climate-aligned investment portfolios.<sup>26</sup> Compared to countries such as India and Vietnam – where central banks have established mandatory green lending quotas – Pakistan's policy frameworks remain largely voluntary. This gap constrains the flow of climate finance into transformative infrastructure, including sustainable mobility systems.

The SBP reports that current green finance levels are insufficient to meet Pakistan's climate preparedness and carbon reduction goals. The country requires

stronger policies, increased private-sector investment, and international collaboration.<sup>27</sup> Financial institutions are working to integrate environmental and social risk management into lending activities, but they struggle with data limitations, regulatory barriers, and restricted capacity to assess and fund environmentally friendly projects.<sup>28</sup> Pakistan's transportation sector is vital to the economy, handling 90% of freight and passenger movement.<sup>29</sup> However, public transport remains outdated and inefficient, dominated by buses, rickshaws, and informal services. Major urban centers such as Karachi, Lahore, and Islamabad face overcrowding, inadequate transit infrastructure, and a lack of integrated transport systems.<sup>30</sup> Rapid urbanization and population growth further increase the need for sustainable transportation solutions.<sup>31</sup>

In addition to these challenges, urban expansion and demographic shifts have placed increased pressure on existing transport infrastructure, highlighting the urgency for long-term planning and investment in sustainable mobility systems.<sup>32</sup> Several significant challenges affect Pakistan's transportation sector,<sup>33</sup> foremost among them pollution.<sup>34</sup> The sector is heavily reliant on fossil fuels, particularly diesel and petrol, which contribute significantly to air pollution, causing health problems and environmental degradation.<sup>35</sup> Vehicular emissions are a major source of urban air pollution.<sup>36</sup> Cities such as Lahore and Karachi frequently rank among the world's most polluted due to vehicle emissions and industrial activities. Chronic traffic congestion plagues major urban centers, leading to economic losses and increased travel times.

Traffic congestion alone is estimated to result in a 3% gross domestic product loss in urban areas due to wasted time and fuel.<sup>37</sup> Existing transport infrastructure is inadequate to meet the demands of a growing population.<sup>38</sup> Poor road conditions and outdated public transport reduce efficiency and user appeal.<sup>39</sup> In addition, Pakistan has one of the highest fatality rates in the region, with over 27,000 deaths annually due to road accidents.<sup>40</sup> In response to these challenges, the government of Pakistan has introduced various sustainable transport initiatives.<sup>41</sup> The Lahore Metrobus, launched in 2013, has successfully reduced traffic congestion, discouraged private vehicle use, and improved urban mobility.<sup>42</sup> The Orange Line Train, inaugurated in 2020, further supports low-emission urban transport. Meanwhile, Lahore's Green Bus Service, powered by compressed natural gas, reduces harmful emissions, though it remains less eco-friendly than fully electrified transport.

The Peshawar BRT project, backed by the Asian Development Bank, features dedicated lanes and an efficient ticketing system to reduce emissions and enhance public transit. Similarly, the Karachi BRT Red Line Project, supported by international financing, aims to introduce electric buses and intelligent transport systems. Another initiative, Green BRT Karachi, seeks to develop a zero-emission BRT system incorporating electric buses and green infrastructure. In addition, Pakistan is moving toward sustainable and multimodal transport systems by promoting cycling, walking, and non-motorized transport options. The Pakistan Electric Vehicle Policy (2020) offers tax relief, reduced import duties on EV parts, and incentives for charging-station development.<sup>30</sup> The policy targets 30% EV adoption by 2030, marking a significant step toward cleaner and more sustainable transport.

While the terms “green finance” and “climate finance” are sometimes used interchangeably, they have distinct scopes. Climate finance refers specifically to funding aimed at reducing greenhouse gas emissions and enhancing climate resilience, as defined under the United Nations Framework Convention on Climate Change. Green finance, a broader concept, includes climate finance but also encompasses investments in environmental sustainability, such as biodiversity conservation, clean water, and pollution reduction. This study uses “green finance” as the overarching term but distinguishes between the two where necessary, especially when stakeholder insights pertain specifically to climate finance.

To frame the barriers to green finance more robustly, this study drew on relevant conceptual models in addition to the Quadruple Helix. Ecological modernization theory helps explain how environmental reforms can be integrated into capitalist structures through institutional innovation, policy alignment, and technological advancement. It supports the idea that effective green financing depends on regulatory modernization and private sector engagement. In addition, institutional theory is relevant in understanding how organizational norms, bureaucratic inertia, and lack of legitimacy hinder the adoption of green finance mechanisms. These frameworks help contextualize Pakistan’s fragmented financial governance and support the identification of structural barriers in the policy–finance nexus. In Pakistan, green finance initiatives have primarily been supported by multilateral donors such as the Green Climate Fund (e.g., Green BRT Karachi), the World Bank, and the Asian Development Bank. Domestically, the SBP introduced Green Banking Guidelines in 2017,

but uptake has been slow. Commercial banks have yet to establish dedicated green finance portfolios, and only a few pilot green bonds have been issued through the PSX. On the recipient side, most funding has gone to infrastructure-linked transport projects, while financing for private-sector EV adoption and innovation remains minimal. Despite policy declarations, Pakistan’s green finance ecosystem remains underdeveloped, with little data transparency and few measurable milestones in fund disbursement or project completion.

### 3. Methodology

This research employed a qualitative method to gain an in-depth understanding of stakeholder perspectives on green financing in sustainable transportation. A semi-structured interview approach was used to collect detailed and nuanced data, allowing participants to elaborate on their experiences while maintaining consistency in data collection. This method facilitated the exploration of complex themes that are not easily quantifiable. The study followed the Quadruple Helix framework, which incorporates perspectives from: (i) Government officials, (ii) non-governmental organizations (NGOs), (iii) academia, and (iv) international organization representatives. These groups were selected for their key roles in shaping, implementing, and influencing green finance policies and initiatives. Purposive sampling was applied to ensure participants had relevant expertise, while convenience sampling facilitated accessibility during participant selection. Ethical considerations, including informed consent and confidentiality, were strictly upheld throughout the research process.

A total of 14 semi-structured interviews were conducted, each lasting approximately 40 – 60 min, allowing participants to elaborate on their perspectives while ensuring consistency across interviews. Participants were selected through a purposive sampling strategy, targeting individuals directly involved in sustainable transportation, policy development, or climate finance. Additional convenience sampling was used to ensure practical access to stakeholders. Participants included representatives from government agencies, NGOs, academia, civil society, and international organizations. The interview guide was validated by two subject matter experts who reviewed the questions for clarity, relevance, and alignment with the research objectives. Their feedback led to minor revisions to question structure and wording, improving clarity and contextual appropriateness for Pakistani stakeholders.

Data were analyzed using thematic analysis, a widely used approach in qualitative research for identifying and interpreting patterns within textual data. Interview transcripts were systematically reviewed and coded to categorize emerging themes. The analysis focused on stakeholder perspectives on policy frameworks, financial mechanisms, sustainability challenges, and institutional barriers. Thematic categories were established by grouping recurring responses, facilitating a structured analysis of key findings. The research instrument consisted of a self-developed semi-structured interview guide, designed to ensure flexibility in participant responses while maintaining a structured framework. The interview protocol was validated by two subject matter experts, whose recommendations were incorporated to enhance the clarity and relevance of the instrument, ensuring alignment with the research's objectives.

Overall, this methodology enabled a comprehensive exploration of green financing practices within the Quadruple Helix framework, ensuring a multi-perspective understanding of stakeholder viewpoints. The combination of semi-structured interviews and thematic analysis provided valuable insights into the financial and policy landscape of sustainable transportation in Pakistan.

To enhance the validity and reliability of findings, triangulation was employed by cross-verifying qualitative insights with national policy documents and secondary datasets. Interview responses were compared against published reports from the SBP, the Ministry of Climate Change, and international organizations such as the United Nations Development Program and the Asian Development Bank. This approach contributed to a more comprehensive understanding of stakeholder claims, reduced potential bias, and ensured consistency between emerging themes and policy-level evidence.

## 4. Findings

A total of 14 participants were involved in the study, including five government officers, two academic scholars, three representatives from NGOs, one civil society member, and three professionals from international agencies. The government officers had extensive experience in policy and regulatory affairs related to climate change and transportation. The academic scholars contributed expertise in sustainable transportation and climate insights into research and policy development. The NGO representatives specialized in energy policy, environmental

sustainability, and climate action, focusing on advocacy and implementation of green finance initiatives. The civil society participant brought experience in grassroots environmental initiatives and public engagement. The international agency professionals provided a global perspective on green finance, economic strategies, and policy frameworks supporting sustainable transportation. These participants played key roles in policy formulation, research, implementation, and advocacy related to green financing and sustainable transportation. Their collective expertise contributed to a comprehensive understanding of the challenges and opportunities in integrating green finance into Pakistan's transport sector. All the details of the respondents are in [Table 1](#).

Following the demographic overview, the identified themes and sub-themes from the thematic analysis are presented below, providing a structured representation of the key findings and their alignment with the interviewees' perspectives related to them.

### 4.1. Theme 1: Challenges in mobilizing finance

Green financing for sustainable transportation faces significant financial, regulatory, and institutional challenges in Pakistan. The availability, accessibility, and efficient utilization of financial resources remain key concerns in scaling up green transport projects. The lack of structured funding mechanisms, regulatory inefficiencies, and institutional gaps further complicates the mobilization of green finance.

#### 4.1.1. Financial barriers

One of the primary challenges is the high cost of green transport infrastructure and limited funding sources. Green transportation projects, such as electric buses, metro systems, and charging stations, require substantial upfront investments. Green transportation infrastructure in Pakistan – such as electric buses, metro systems, and EV charging stations – requires high upfront capital, which is currently unavailable at scale. According to the SBP (2023), Pakistan needs an estimated 7 – 9 billion USD annually to meet its climate resilience and mitigation goals, with a significant portion required for the transport and energy sectors. However, <1% of total domestic credit flows currently support green initiatives, reflecting a severe financing gap. Despite the National EV Policy targeting 30% EV penetration by 2030, only 1600 EVs were registered nationwide by the end of 2022 out of more than 32 million total vehicles, according to the Pakistan Bureau of Statistics and the Ministry of Climate Change. This underlines the lack of

**Table 1. Demographic details of the respondents**

Name	Organization	Experience	Sector	Role/Profession
AH	Special Monitoring Unit	12 years	Government	Head of Special Monitoring Unit
BI	Ministry of Climate Change	8 years	Government	Section Officer
AK	Ministry of Climate Change	18 years	Government	Director
SL	Ministry of Communication	18 years	Government	Director of Transport
UZ	SDPI	7 years	Non-governmental	Head of Energy Unit
HJ	Center for Environmentally Sustainable Transport	17 years	Non-governmental	Chief Executive Officer of Indus Consortium
MI	SDPI	15 years	Non-governmental	Senior research fellow
YD	Climate Action Centre–Darya Lab	11 years	Civil society organization	Founder
DA	World Bank	15 years	International agency	Global lead
AW	NICE, NUST	12 years	Academia	Professor
BW	Stanford University	16 years	Academia	Professor
SR	World Bank	9 years	International agency	Senior economist

Abbreviations: NICE: NUST Institute of Civil Engineering; NUST: National University of Science and Technology; SDPI: Sustainable Development Policy Institute.

adequate financial instruments, concessional loans, and blended finance mechanisms to mobilize investment in green mobility.

Green bonds and international climate funds remain underutilized in Pakistan’s transport sector, particularly for large-scale electrification, BRT expansion, and charging infrastructure development. While the PSX introduced its first green bond framework in 2021 and the Green Climate Fund (GCF) approved the Green BRT Karachi project (FP085), overall uptake has been minimal. Key barriers include low investor confidence, lack of project bankability, and the absence of a national green finance taxonomy. Moreover, procedural hurdles, such as lengthy application processes, inadequate feasibility studies, and misalignment with global reporting standards, discourage access to multilateral funds such as the GCF, Climate Investment Funds, and Global Environment Facility. As a result, opportunities to fund sustainable transport remain largely untapped. Furthermore, private investors often perceive these projects as high-risk, long-gestation ventures, further restricting capital inflows into sustainable transport. This theme is reflected in the perspectives of interviewees, as shown below:

*“The cost of electrifying the public transport is too high, as it cannot be done without a concessional loan or subsidy.” (SL, oral communication, [August] [11], [2024])*

*“Innovative financing mechanisms like blended finance can reduce high upfront costs, but they are not yet operational in Pakistan.” (DB, oral communication, [September] [23], [2024])*

*“We have to come up with local solutions – using local materials and technology – to reduce costs.” (HJ, oral communication, [July] [12], [2024])*

*“The green financial ecosystem in Pakistan is still underdeveloped, and access to global funds is also difficult due to procedural inefficiencies.” (YD, oral communication, [April] [19], [2024])*

*“There is a lack of capacity in financial institutions to design and implement green finance projects, creating further hurdles in accessing international climate funds.” (AW, oral communication, [May] [23], [2024])*

From a business perspective, many private-sector actors view sustainable transport investments as financially unviable due to long return cycles, lack of risk-sharing mechanisms, and limited tax or policy incentives. Several stakeholders noted that businesses are hesitant to shift toward electric fleets or invest in clean logistics without strong regulatory guarantees and accessible financing channels. The evidence indicates that financial risk perception and the absence of targeted business incentives are key barriers to environmental sustainability in Pakistan’s transportation sector.

#### 4.1.2. Regulatory constraints

The absence of a clear financial regulatory framework for green transport projects poses a major challenge. There is no dedicated national policy that aligns financial incentives with low-carbon transport goals. Policies such as the National Transport Policy (2018)

and the EV Policy (2020) mention sustainability but lack structured financial mechanisms to support investments. In addition, slow bureaucratic processes, unclear eligibility criteria, and a lack of inter-agency coordination contribute to policy misalignment, delaying financial approvals and increasing project costs. This theme is supported by the perspectives of interviewees as follows:

*“The absence of green finance clauses in most national policies indicates a lack of foresight in addressing sustainability.” (BI, oral communication, [April] [11], [2024])*

*“Disjointed policies between federal and provincial governments create barriers to implementing green finance effectively.” (HJ, oral communication, [July] [29], [2024])*

*“Stakeholders are in a state of confusion due to policy gaps, and there is no uniform framework regarding green finance initiatives.” (MI, oral communication, [May] [15], [2024])*

*“The bureaucracy involved in approving green finance projects is characterized by long delays, which discourages investors.” (AK, oral communication, [June] [16], [2024])*

*“Due to a lack of clear and consistent policies, it is difficult to align green finance projects with international funding requirements.” (BI, oral communication, [June] [15], [2024])*

#### 4.1.3. Institutional gaps

Several key institutions – including the SBP, Planning Commission, Ministry of Communications, and commercial banks – lack the technical capacity to design, assess, and monitor green transport projects. For instance, the SBP's green banking guidelines, though introduced in 2017, are not fully integrated into mainstream lending practices. The Planning Commission's Public Sector Development Program also lacks a dedicated screening process for environmental or low-carbon criteria. Most local banks and development finance institutions do not have green finance divisions or climate risk analysts. This results in limited pipeline development, poor project structuring, and misalignment with international investment requirements. Institutional coordination between ministries and financial regulators is also weak, leading to fragmented efforts and underutilization of global funding windows. Without institutional reform and capacity enhancement, scaling up green transport finance will remain a significant challenge. The absence of capacity-building programs results in low awareness and inefficient allocation of financial

resources. Furthermore, weak cross-sector collaboration among government agencies, financial institutions, and private investors prevents the establishment of effective green finance models such as PPPs. Without strong institutional coordination and knowledge-sharing mechanisms, green financing initiatives remain fragmented and difficult to scale. This theme is supported by the perspectives of interviewees as follows:

*“There is a significant knowledge gap among policymakers and financial institutions regarding the structuring of green finance projects.” (DB, oral communication, [June] [12], [2024])*

*“Capacity-building initiatives should target both public and private sector actors to ensure a comprehensive understanding of green finance.” (BI, oral communication, [May] [11], [2024])*

*“Training programs tailored to local contexts can bridge the knowledge gap and empower stakeholders to effectively utilize green finance mechanisms.” (HJ, oral communication, [June] [14], [2024])*

*“Green finance requires a multi-stakeholder approach, but in Pakistan, the lack of coordination between government agencies, private sector actors, and civil society remains a major challenge.” (YD, oral communication, [April] [1], [2024])*

*“Creating platforms for cross-sector dialogue could foster better collaboration and lead to more effective implementation of green finance initiatives.” (MI, oral communication, [June] [1], [2024])*

## 4.2. Theme 2: Policy integration

A well-defined policy framework is essential for integrating green finance into sustainable transportation initiatives. However, Pakistan lacks a cohesive policy structure that effectively aligns financial incentives, regulatory mandates, and sustainability objectives. Existing policies provide general direction but fail to establish a comprehensive mechanism for green financing in the transport sector. The misalignment between national and provincial policies, coupled with inadequate financial incentives, creates significant barriers to investment. Strengthening policy integration can enhance financial accessibility, regulatory clarity, and long-term sustainability in green transportation projects.

### 4.2.1. Embedding green finance in policies

Green finance needs to be institutionalized within national and local transport strategies to ensure consistent implementation. However, the absence of

clear regulatory mandates, the lack of harmonized policies, and weak coordination between financial institutions and government agencies have slowed down the adoption of green transport finance. In addition, financial incentives such as subsidies, tax exemptions, and concessional loans remain limited or inaccessible, reducing the attractiveness of green transport investments. A well-structured monitoring and evaluation framework is also lacking, making it difficult to assess the impact of green financing initiatives in the transport sector. This theme is supported by the perspectives of interviewees as follows:

*“There exists no defining policy structure that connects green finance initiatives with transport directives.” (UZ, oral communication, [January] [11], [2025])*

*“Green finance is often viewed as something complex, and there’s limited effort to train local stakeholders in understanding its scope.” (AK, oral communication, [February] [22], [2024])*

*“Disjointed policies between federal and provincial governments create barriers to implementing green finance effectively.” (HJ, oral communication, [May] [30], [2024])*

*“Policy harmonization will create clarity for both public and private sector actors.” (AW, oral communication, [April] [12], [2023])*

#### 4.2.2. Strategic decarbonization

The transition toward low-carbon transportation is crucial for achieving climate resilience and meeting global sustainability commitments. However, current financing mechanisms do not adequately support decarbonization efforts in the transport sector. Limited funding for EVs, inadequate infrastructure for clean energy-powered transport, and the slow adoption of green mobility solutions hinder progress. In addition, private sector engagement in sustainable transportation is constrained by financial risks, unclear policies, and a lack of long-term investment security. To accelerate transport decarbonization, green finance must be strategically linked to national climate policies, energy transition goals, and urban development strategies, thereby ensuring a cohesive and sustainable mobility framework. This theme is supported by the perspectives of my interviewees as follows:

*“Green finance is not just about funding; it is about creating an ecosystem that encourages sustainability.” (BI, oral communication, [May] [11], [2024])*

*“Climate finance is an element of green finance that supports main strategies. Green financial initiatives*

*target a wider range of sustainability goals beyond the specifications of climate finance programs.” (DA, oral communication, [July] [13], [2024])*

*“The absence of green finance clauses in most national policies indicates a lack of foresight in addressing sustainability.” (SR, oral communication, [May] [22], [2024])*

*“Green finance needs to be embedded in both urban and rural transport strategies to ensure inclusivity.” (YD, oral communication, [February] [22], [2024])*

#### 4.3. Theme 3: Leveraging international finance

Pakistan’s green finance landscape faces significant funding gaps, making international financial support essential for scaling up sustainable transportation initiatives. International financial mechanisms, such as climate funds, multilateral partnerships, and green financial instruments, offer critical opportunities to bridge the financial shortfall. However, access to these funds remains a challenge due to bureaucratic inefficiencies, weak institutional frameworks, and limited alignment with global investment standards. Strengthening engagement with international finance can enhance funding accessibility, investment security, and the large-scale adoption of sustainable mobility solutions.

##### 4.3.1. Global mechanisms

Various international climate finance mechanisms exist to support low-carbon transport initiatives, but Pakistan faces challenges in accessing them. Organizations such as the GCF, Climate Investment Funds, and the Global Environment Facility provide financial support for sustainable transport projects, yet Pakistan’s ability to secure these funds remains limited. The application process for international climate finance is often complex, requiring strong governance structures, transparent accountability mechanisms, and compliance with international sustainability standards – areas where Pakistan currently faces deficiencies. In addition, there is limited capacity among local financial institutions and policymakers to develop competitive project proposals that meet the requirements of global funding agencies. This theme is supported by the perspectives of interviewees, several of whom emphasized the conceptual distinction between green finance and climate finance:

*“Climate finance is an element of green finance that mainly involves climate change reduction strategies.” (DA, oral communication, [May] [11], [2024])*

*“Green finance incorporates extensive sustainability objectives, but climate finance exclusively deals with climate change response initiatives.” (SR, oral communication, [January] [22], [2024])*

*“The difference between green and climate finance is often misunderstood, leading to challenges in aligning international funding opportunities with national priorities.” (BW, oral communication, [June] [11], [2024])*

These insights underscore the need to distinguish between climate-specific and broader green finance mechanisms in policy frameworks, particularly when engaging with international donors and designing national financial strategies.

#### 4.3.2. Multilateral partnerships

Collaboration with multilateral financial institutions and bilateral agreements with foreign governments play a crucial role in expanding access to green finance. Organizations such as the World Bank, Asian Development Bank, and International Finance Corporation provide technical assistance and financial support for sustainable transport projects. However, Pakistan has not fully optimized these partnerships due to weak institutional linkages, bureaucratic inefficiencies, and policy misalignment. In addition, bilateral agreements with countries leading in sustainable transport financing (such as Germany, China, and Norway) can provide concessional loans, technical expertise, and financial grants. Yet, Pakistan lacks a structured approach to negotiating and securing these partnerships. Strengthening government-to-government engagements and fostering long-term partnerships with global financial institutions can significantly enhance green transport investments. This theme is supported by the perspectives of interviewees as follows:

*“Multilateral development banks have been instrumental in sparking the co-financing of projects and providing technical assistance to green finance initiatives.” (HJ, oral communication, [January] [11], [2024])*

*“Bilateral agreements with developed countries help in the technology transfer and funding of green initiatives.” (YD, oral communication, [February] [15], [2024])*

*“These things can move faster through government-to-government agreements and develop trust among the stakeholders.” (SL, oral communication, [May] [23], [2024])*

#### 4.3.3. Financial instruments

The utilization of green financial instruments, such as green bonds, carbon credits, and blended finance models, has emerged as a key strategy for attracting international investment in sustainable transportation. However, Pakistan's financial sector has been slow to adopt these mechanisms due to regulatory gaps, a lack of investor confidence, and underdeveloped capital markets. Green bonds – widely used in countries like China, the United States, and members of the European Union – could provide a significant funding avenue for transport decarbonization if effectively introduced and regulated in Pakistan. Similarly, carbon trading markets remain underdeveloped, preventing the country from leveraging carbon credit financing for transport electrification and low-carbon mobility projects. Expanding PPPs within the green finance sector could enhance investor confidence and encourage international financial institutions to support Pakistan's sustainable transport transformation. This theme is supported by the perspectives of interviewees as follows:

*“Pakistan should explore successful case studies like India's use of green bonds for urban mobility as a model for financing sustainable transport.” (YD, oral communication, [June] [11], [2024])*

*“Our financial sector lacks the necessary mechanisms to effectively utilize green bonds, carbon credits, and blended finance models, leaving us behind in attracting international investments.” (DB, oral communication, [May] [2], [2024])*

*“The slow adoption of carbon credit financing is a missed opportunity that could provide additional resources for transport electrification and infrastructure decarbonization.” (AK, oral communication, [July] [3], [2024])*

#### 4.4. Limitations

While this study offers valuable insights through qualitative methods, it is limited by the small sample size of 14 participants, which may not fully capture the diversity of perspectives across all provinces or sectors. In addition, purposive and convenience sampling may introduce bias, as participants were selected based on accessibility and known expertise, potentially excluding dissenting or peripheral views. The findings, therefore, reflect perceptions of actively engaged stakeholders and may not be fully generalizable across the broader institutional landscape.

## 5. Conclusion

This study explored the barriers and opportunities for mobilizing green finance to promote sustainable transportation in Pakistan. The findings revealed that high infrastructure costs, limited financial instruments, policy misalignment, and weak institutional capacity are core impediments. These challenges directly reflect the study's first objective of identifying barriers to green finance implementation. In addition, while the research found limited use of green bonds, climate funds, and PPPs, it also highlighted stakeholder interest in innovative mechanisms like blended finance, addressing the second objective of exploring alternative instruments. The Quadruple Helix perspective revealed fragmented collaboration among government, private, academic, and civil society actors, underscoring the need for enhanced coordination in line with stakeholder-focused goals.

Interestingly, some stakeholder perspectives diverged from prevailing public assumptions. For instance, while public discourse often attributes the failure of green transport initiatives to technology or public behavior, several participants emphasized that policy incoherence and a lack of institutional accountability are the true limiting factors. Others challenged the assumption that public transport electrification alone would resolve urban congestion, pointing instead to governance and planning issues. These contrasting perspectives highlight the need for further research into policy execution and stakeholder coordination.

## 6. Recommendations for action

Based on the findings of this study, the following actionable recommendations are proposed to enhance the mobilization of green finance for sustainable transport in Pakistan:

- (i) Develop a national green transport finance strategy within 12–18 months, led by the Ministry of Finance and the Ministry of Climate Change, with technical support from the SBP. This strategy should establish eligibility criteria, risk-mitigation tools, and a project pipeline mechanism.
- (ii) Activate and expand the use of green bonds and blended finance, particularly for urban electric bus systems and EV charging infrastructure. The PSX and SBP should co-lead a working group by Q2 2025 to design guidelines and facilitate investor participation.

- (iii) Strengthen stakeholder coordination platforms at national and provincial levels by establishing a Green Transport Finance Task Force, co-chaired by the Planning Commission and civil society networks, to be formalized within 6 months.
- (iv) Build capacity across financial institutions and line ministries, targeting mid-career officers through joint training programs developed in collaboration with academic partners such as the National University of Science and Technology, Lahore University of Management Sciences, and the Sustainable Development Policy Institute by mid-2026.

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## Conflict of interest

The authors declare no conflicts of interest.

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## Availability of data

The data supporting the findings of this study are available from the corresponding author on reasonable request. However, due to confidentiality agreements with interview participants, full transcripts are not publicly available.

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