

ROAD TRANSPORT DECARBONIZATION, TOURIST MOBILITY, AND SUSTAINABLE TOURISM: AN INTEGRATED REVIEW WITH POLICY IMPLICATIONS FOR INDONESIA

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ABSTRAK

Urgensi perubahan iklim mendorong perhatian terhadap dekarbonisasi transportasi dan mobilitas berkelanjutan dalam pembangunan pariwisata yang berkelanjutan. Namun, studi yang mengintegrasikan ketiganya secara komprehensif masih terbatas. Penelitian ini bertujuan untuk mensintesis hubungan antara dekarbonisasi transportasi darat, mobilitas wisatawan, dan pariwisata berkelanjutan, dengan fokus pada implikasi kebijakan di Indonesia. Menggunakan metode Systematic Literature Review (SLR) berkerangka PRISMA terhadap 61 artikel terindeks Scopus, data dianalisis melalui sintesis tematik. Hasil penelitian mengidentifikasi lima tema utama: (1) mobilitas berkelanjutan dan dekarbonisasi transportasi, (2) mobilitas dan aksesibilitas wisatawan, (3) transportasi publik dan konektivitas destinasi, (4) luaran pariwisata berkelanjutan, serta (5) kebijakan dan tata kelola. Temuan menunjukkan bahwa dekarbonisasi transportasi memengaruhi pariwisata berkelanjutan melalui perubahan mobilitas dan aksesibilitas bagi wisatawan. Mobilitas wisatawan menjadi mekanisme penghubung utama antara intervensi transportasi dan keberlanjutan. Penelitian ini mengusulkan kerangka konseptual terintegrasi yang memposisikan dekarbonisasi sebagai pendorong pariwisata berkelanjutan. Bagi Indonesia, implikasi penelitian ini menekankan pentingnya peningkatan transportasi publik, penguatan konektivitas destinasi, serta integrasi kebijakan transportasi dan pariwisata untuk mendukung pembangunan pariwisata rendah karbon.

Kata kunci: Dekarbonisasi transportasi; indonesia; mobilitas berkelanjutan; mobilitas wisatawan; pariwisata berkelanjutan

ABSTRACT

The increasing urgency of climate change has driven attention toward transport decarbonization and sustainable mobility as vital components of sustainable tourism development. However, studies comprehensively integrating these three aspects remain limited. This study aims to synthesize the relationships among land transport decarbonization, tourist mobility, and sustainable tourism development, with a focus on policy implications for Indonesia. Using a Systematic Literature Review (SLR) guided by the PRISMA framework, data from 61 Scopus-indexed articles were analyzed through thematic synthesis. The findings identify five main themes: (1) sustainable mobility and transport decarbonization, (2) tourist mobility and accessibility, (3) public transport and destination connectivity, (4) sustainable tourism outcomes, and (5) policy and governance. Transport decarbonization influences sustainable tourism primarily through changes in tourist mobility and accessibility. Tourist mobility serves as the primary bridge between transport interventions and sustainability outcomes. This study proposes an integrated conceptual framework that positions decarbonization as a driver of sustainable tourism. For Indonesia, the implications underscore the need to improve public transport, strengthen destination connectivity, and integrate transport and tourism policies to support low-carbon tourism.

Keywords: Indonesia; sustainable mobility; sustainable tourism; tourist mobility; transport decarbonization

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1. INTRODUCTION

Climate change has emerged as one of the most significant challenges facing contemporary societies, prompting governments, industries, and communities to seek pathways toward more sustainable development (Choomanee et al., 2025; Gühnemann et al., 2021). The transportation sector has become a focal point within this transition because of its substantial contribution to greenhouse gas emissions and energy consumption (Betta et al., 2021; Henke, 2020). Road transportation, in particular, remains heavily dependent on fossil fuels and continues to account for a large share of transport-related emissions worldwide (Choomanee et al., 2025; Rendeiro Martín-Cejas & Ramírez Sánchez, 2021). Consequently, reducing emissions from transport systems has become a critical component of national and international sustainability agendas.

At the same time, tourism has become one of the world's largest and most dynamic economic sectors, serving as a key driver for socio-economic progress (Campos et al., 2023; Jaffar et al., 2025). Tourism contributes significantly to economic growth, employment generation, regional development, and cultural exchange. However, tourism activities are inherently dependent on mobility, necessarily entailing the movement of people from their origins to destinations (Gühnemann et al., 2021; Hussain et al., 2023). As a result, transportation systems play a fundamental role in shaping tourism experiences and destination competitiveness (Prideaux, 2000; Cattaruzzo et al., 2026).

The relationship between tourism and transportation has become increasingly important in discussions of sustainability (Bausch, 2024; Hussain et al., 2023). Growing tourist flows generate additional travel demand, which can contribute to congestion, environmental degradation, energy consumption, and carbon emissions (Bausch, 2024; Gühnemann et al., 2021). These challenges are particularly evident in destinations that rely heavily on private vehicles or lack integrated transport systems (Paulino et al., 2025; Rendeiro Martín-Cejas & Ramírez Sánchez, 2021; Waleghwa, 2025). Consequently, researchers and policymakers have increasingly recognized that achieving sustainable tourism requires not only sustainable destination management but also sustainable mobility systems that support tourism activities while minimizing environmental impacts.

In recent years, the concept of sustainable mobility has gained considerable attention as a framework for addressing transportation-related sustainability challenges. Sustainable mobility extends beyond the traditional objective of moving people efficiently; instead, it emphasizes accessibility, environmental responsibility, and social inclusion (Henke et al., 2020; Rosa-Jiménez et al., 2023). In tourism contexts, sustainable mobility encompasses a wide range of approaches, including public transportation, active mobility, micromobility, and integrated mobility solutions designed to improve accessibility while reducing environmental pressures (Khawjankong & Arreeras, 2026; Szymańska et al., 2021).

The growing emphasis on sustainable mobility has also contributed to the emergence of transport decarbonization as a major policy agenda. Transport decarbonization refers to efforts to reduce greenhouse gas emissions through technological innovation, behavioral change, and policy interventions (Cartenì et al., 2020; Choomanee et al., 2025). Common strategies include adopting electric vehicles, expanding public transportation networks, and developing low-carbon mobility systems (Gühnemann et al., 2021; Philips et al., 2024). These initiatives are increasingly viewed as essential for achieving climate goals while maintaining economic and social development objectives.

Within tourism destinations, transport decarbonization offers opportunities that extend beyond environmental benefits. Low-carbon transport systems can improve destination accessibility, enhance visitor experiences, and strengthen destination competitiveness (Gutiérrez & Miravet, 2016; Jaffar et al., 2025). Public transportation systems and integrated mobility solutions facilitate tourist movement while simultaneously supporting sustainability objectives (Bausch et al., 2024; Cattaruzzo et al., 2026). Consequently, transport decarbonization is increasingly being recognized as an important component of sustainable tourism development.

Despite growing academic interest in sustainable mobility, transport decarbonization, and tourism sustainability, existing research remains fragmented (Hopkins, 2020; Paulino et al., 2025). Many studies examine transport decarbonization primarily from environmental and technological perspectives, focusing on emission reduction, vehicle electrification, and energy efficiency (Choomanee et al., 2025; Henke, 2020). Other studies investigate tourist mobility, emphasizing travel behavior, accessibility, mode choice, and visitor experiences (Cattaruzzo et al., 2026; Masiero & Zoltan, 2013). Meanwhile, sustainable tourism research often focuses on destination management, environmental conservation, and tourism impacts (Bausch, 2024; Rahman et al., 2025).

This fragmentation has created several important knowledge gaps. First, limited research has examined how transport decarbonization strategies influence tourist mobility patterns (Paulino et al., 2025; Waleghwa, 2025). While numerous studies investigate low-carbon transport systems and sustainable mobility initiatives, their implications for tourist behavior and destination accessibility remain insufficiently understood. Second, existing literature often treats mobility as an outcome of transport systems rather than as a strategic mechanism that links transportation policies to tourism sustainability outcomes (Hussain et al., 2023; Zamparini & Pappadà, 2025). Third, research integrating transport decarbonization, tourist mobility, and sustainable tourism within a single analytical framework remains relatively limited (Hussain et al., 2023; Scuttari et al., 2013).

Another important limitation concerns geographical context. The majority of existing studies have been conducted in developed countries, particularly within European destinations characterized by advanced transport infrastructure, integrated mobility systems, and relatively mature sustainability policies (Khawjankong & Arreeras, 2026; Wang & Ariffin, 2026). Although these studies provide valuable insights, their findings may not be directly applicable to developing countries facing different institutional, geographical, and infrastructural conditions (Jaffar et al., 2025; Permana et al., 2024). This issue is particularly relevant for Indonesia, an archipelagic country characterized by dispersed tourism destinations, uneven transport connectivity, growing tourism demand, and increasing commitments to sustainable development and climate action (Rahman et al., 2025; Tussadiah et al., 2021).

For Indonesia, improving the sustainability of tourist mobility represents both an environmental necessity and a development opportunity (Rahman et al., 2025; Tussadiah et al., 2021). The country has adopted various initiatives related to sustainable tourism, green growth, and carbon emission reduction (Rahman et al., 2025; Suryawan et al., 2025b). However, achieving these objectives requires a better understanding of how transport decarbonization strategies can influence tourist mobility and contribute to broader tourism sustainability outcomes. Such understanding is particularly important given Indonesia's dependence on transportation networks to connect diverse tourism destinations distributed across thousands of islands.

Based on these considerations, this study aims to synthesize existing knowledge regarding the relationships between road transport decarbonization, tourist mobility, and sustainable tourism development. By systematically reviewing 46 Scopus-indexed journal articles, this study seeks to identify dominant research themes, examine the relationships between transport decarbonization and tourist mobility, and derive policy implications relevant to sustainable tourism development in Indonesia (Choomanee et al., 2025; Paulino et al., 2025).

Specifically, this study addresses three research questions:

1. What are the dominant themes in the literature on road transport decarbonization and tourist mobility?
2. How does road transport decarbonization influence tourist mobility and sustainable tourism outcomes?
3. What policy implications can be derived for sustainable tourism development in Indonesia?

2. LITERATURE REVIEW

2.1 Sustainable Mobility and Transport Decarbonization

The growing urgency of climate change has accelerated global interest in sustainable mobility and transport decarbonization (Choomanee et al., 2025; Gühnemann et al., 2021). Sustainable mobility refers to transportation systems that meet current mobility needs while minimizing environmental impacts, promoting social inclusion, and supporting long-term economic sustainability (Hussain et al., 2023; Szymańska et al., 2021). Unlike traditional transportation planning, which primarily focuses on efficiency and movement, sustainable mobility emphasizes accessibility, environmental responsibility, and quality of life (Henke et al., 2020; Rosa-Jiménez et al., 2023).

In this context, transport decarbonization has emerged as a key strategy to reduce greenhouse gas emissions from transportation activities (Choomanee et al., 2025; Starčević et al., 2025). Decarbonization efforts typically involve technological innovation, policy interventions, and behavioral change aimed at reducing dependence on fossil-fuel-based transportation systems (Urban et al., 2024). Common approaches include vehicle electrification, low-carbon transport infrastructure, public transport enhancement, active mobility promotion, and smart mobility solutions (Gühnemann et al., 2021; Khawjankong & Arreeras, 2026).

Recent studies suggest that successful transport decarbonization requires more than technological transformation alone (Gühnemann et al., 2021; Urban et al., 2024). While electric vehicles and alternative energy sources contribute to emission reduction, long-term sustainability depends on broader mobility transitions that encourage modal shifts, reduce car dependency, and improve transport accessibility (Paulino et al., 2025; Waleghwa, 2025). Consequently, sustainable mobility and transport decarbonization are increasingly viewed as complementary approaches within broader sustainability transitions (Hussain et al., 2023; Starčević et al., 2025).

In tourism contexts, sustainable mobility and transport decarbonization have gained increasing attention because tourism activities depend heavily on transportation systems (Campos et al., 2023; Gühnemann et al., 2021). Tourism-related travel contributes significantly to energy consumption and carbon emissions, creating growing pressure for destinations to adopt low-carbon mobility solutions (Rahman et al., 2025; Safaa et al., 2023). As a result, transport sustainability has become an important component of sustainable destination development (Bausch, 2024; Zamparini et al., 2025).

2.2 Tourist Mobility and Accessibility

Tourist mobility refers to the movement of visitors before, during, and after tourism experiences (Cattaruzzo et al., 2026). It encompasses not only physical travel but also transportation choices, route selection, perceptions of accessibility, and interactions with destination infrastructure. Because tourism fundamentally depends on movement, mobility has become one of the most important dimensions of tourism development and destination competitiveness (Gühnemann et al., 2021; Prideaux, 2000).

Accessibility represents a central component of tourist mobility. Accessible transportation systems influence tourists' ability to reach destinations, move between attractions, and access tourism services (Iamtrakul et al., 2025). Consequently, transportation infrastructure and mobility systems directly affect visitor satisfaction, destination attractiveness, and tourism performance (Thompson & Schofield, 2007).

Previous research has demonstrated that tourist mobility is shaped by multiple factors, including transportation availability, travel costs, infrastructure quality, convenience, safety, and environmental considerations (Choomanee et al., 2025; Khawjankong & Arreeras, 2026). Increasingly, studies have highlighted the role of sustainable mobility options, such as public transportation, cycling infrastructure, pedestrian networks, and integrated mobility systems, in enhancing tourism experiences while reducing environmental impacts (Bausch, 2024; Szymańska et al., 2021).

The literature further suggests that tourist mobility should not be viewed merely as a consequence of transportation systems. Rather, mobility functions as a dynamic process through which transportation interventions influence tourism outcomes (Hussain et al., 2023; Paulino et al., 2025). Changes in accessibility, travel behavior, and mode choice can substantially affect visitor experiences and destination sustainability. Consequently, understanding tourist mobility is essential for explaining the relationship between transportation systems and tourism development.

2.3 Sustainable Tourism Outcomes

Sustainable tourism has become one of the dominant paradigms guiding contemporary tourism development (Perkumienė et al., 2023; Roblek et al., 2021). The concept emphasizes the balanced integration of environmental protection, economic viability, and social well-being to ensure the long-term sustainability of tourism destinations. Rather than focusing exclusively on visitor numbers or economic growth, sustainable tourism seeks to minimize negative impacts while maximizing benefits for local communities and ecosystems (Hussain et al., 2023; Rahman et al., 2025).

A wide range of interconnected factors, including governance, resource management, environmental quality, community participation, and accessibility, influences destination sustainability. Transportation plays a particularly important role because it directly affects how visitors access and experience destinations (Gühnemann et al., 2021; Iamtrakul et al., 2025). Transportation systems influence tourism-related emissions, visitor flows, congestion levels, environmental conditions, and destination competitiveness (Cattaruzzo et al., 2026; Prideaux, 2000).

Recent literature increasingly recognizes that sustainable tourism outcomes extend beyond environmental indicators. Visitor satisfaction, quality of experience, community acceptance, accessibility, and destination resilience have emerged as important dimensions of sustainability (Bausch, 2024; Kim et al., 2024b). Consequently, sustainable tourism should be understood as a multidimensional outcome resulting from interactions among environmental, social, economic, and mobility-related factors (Hussain et al., 2023; Zamparini et al., 2025).

Within this perspective, transportation systems become strategic components of sustainable tourism rather than merely supporting infrastructure. Sustainable mobility initiatives, public transport improvements, and transport decarbonization strategies may therefore contribute simultaneously to environmental objectives and tourism development goals (Choomanee et al., 2025; Paulino et al., 2025).

2.4 Conceptual Linkages and Research Framework

Although sustainable mobility, tourist mobility, transport decarbonization, and sustainable tourism have each received growing scholarly attention, the relationships among these concepts remain insufficiently integrated (Hopkins, 2020; Paulino et al., 2025). Existing studies often examine transportation systems from environmental and technological perspectives, while tourism studies typically focus on destination management, visitor behavior, and tourism impacts. Consequently, opportunities to understand the interactions between these domains remain limited (Scuttari et al., 2013; Zamparini & Pappadà, 2025).

The emerging literature suggests that tourist mobility may be a critical link between transport decarbonization and sustainable tourism outcomes (Hussain et al., 2023; Zamparini et al., 2025). Transport interventions such as public transportation improvements, active mobility infrastructure, low-carbon transport systems, and accessibility enhancements influence how tourists move within destinations. These changes in mobility patterns subsequently affect environmental performance, visitor experiences, destination competitiveness, and sustainability outcomes (Cattaruzzo et al., 2026; Gühnemann et al., 2021).

From this perspective, the present study conceptualizes sustainable mobility and transport decarbonization as enabling factors shaping tourist mobility. Tourist mobility, in turn, functions as an intermediary mechanism through which transportation interventions influence sustainable

tourism outcomes (Choomanee et al., 2025; Rahman et al., 2025). This conceptualization provides a foundation for synthesizing existing literature and identifying policy implications relevant to Indonesia.

Accordingly, this review adopts an integrated perspective that positions transportation and tourism as interconnected components of broader sustainability transitions (Gühnemann et al., 2021; Urban et al., 2024). Such an approach is particularly relevant for developing archipelagic countries where transportation connectivity plays a critical role in tourism development and sustainability performance (Jaffar et al., 2025; Rungskunroch et al., 2021).

3. METHOD

3.1 Research Design

This study employed a Systematic Literature Review (SLR) approach to synthesize existing knowledge on the relationships between road transport decarbonization, tourist mobility, and sustainable tourism development. A systematic review was selected because it enables researchers to identify, evaluate, and synthesize evidence from existing studies in a transparent and replicable manner (Tranfield et al., 2003). Compared with traditional narrative reviews, SLR provides a structured process for examining research trends, theoretical developments, and knowledge gaps within a particular field of inquiry (Snyder, 2019).

To ensure methodological rigor and transparency, this review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Page et al., 2021). The PRISMA approach provides systematic procedures for literature identification, screening, eligibility assessment, and final inclusion, thereby enhancing the reliability and reproducibility of review findings.

3.2 Literature Search Strategy

The literature search was conducted using the Scopus database. Scopus was selected because it is one of the largest multidisciplinary databases of peer-reviewed literature and provides comprehensive coverage of high-quality academic publications across transportation, sustainability, and tourism studies.

The search strategy was designed to identify studies situated at the intersection of road transportation, sustainability transitions, and tourism mobility. The following Boolean search string was applied:

("road transport" OR "road transportation" OR "public transport" OR "surface transport" OR "green mobility")
AND
(decarbonization OR decarbonisation OR "low carbon" OR sustainability)
AND
(tourism OR tourist OR "tourist mobility" OR "sustainable tourism")

The search was conducted without geographical restrictions to capture global perspectives on transport decarbonization and tourist mobility. The focus on international literature was intended to identify dominant themes, theoretical perspectives, and policy approaches relevant to sustainable tourism development.

3.3 Inclusion and Exclusion Criteria

To ensure relevance and consistency, articles were selected based on predefined inclusion and exclusion criteria.

Inclusion Criteria

- Peer-reviewed journal articles indexed in Scopus.

- Articles published in English.
- Studies discussing road transport, public transport, sustainable mobility, transport decarbonization, tourist mobility, accessibility, or sustainable tourism.
- Studies examining transportation issues within tourism or destination contexts.
- Full-text articles available for review.

Exclusion Criteria

- Conference proceedings, editorials, notes, and book chapters.
- Articles unrelated to tourism, tourist mobility, or sustainable transportation.
- Studies focusing exclusively on freight transportation without tourism relevance.
- Duplicate records.
- Publications lacking sufficient conceptual or empirical information.

The screening process resulted in a final corpus of 61 journal articles that met all inclusion criteria and were subsequently included in the review.

3.4 Data Extraction and Analysis

Following article selection, relevant information was systematically extracted from each study. The extracted information included publication year, study location, research objectives, methodologies, key findings, identified research gaps, and policy implications. These data were organized into a literature review matrix to facilitate comparison across studies.

The analysis employed a thematic synthesis approach adapted from Thomas and Harden (2008). Thematic synthesis is particularly suitable for integrating findings from studies conducted in diverse geographical, disciplinary, and methodological contexts. This approach enables researchers to identify recurring concepts, patterns, and relationships across the literature.

The analytical process consisted of three stages. First, open coding was conducted to identify key concepts and recurring topics within the selected articles. Second, related concepts were grouped into broader thematic categories. Third, relationships among themes were examined to develop a comprehensive understanding of how transport decarbonization strategies influence tourist mobility and sustainable tourism outcomes.

3.5 Theme Development

The analytical framework of this study positions tourist mobility as a key intermediary. The thematic analysis identified five major themes within the reviewed literature:

1. Sustainable Mobility and Transport Decarbonization;
2. Tourist Mobility and Accessibility;
3. Sustainable Tourism Outcomes;
4. Public Transport and Destination Connectivity; and
5. Policy and Governance for Sustainable Mobility.

These themes represent the dominant areas of scholarly attention and provide the foundation for the subsequent results and discussion.

3.6. Analytical Framework

This study positions tourist mobility as a critical intermediary mechanism linking transport decarbonization and sustainable tourism outcomes. Within this framework, transport interventions such as public transport improvements, active mobility initiatives, electric vehicle

adoption, accessibility enhancement, and low-carbon mobility policies influence tourist mobility patterns.

Changes in tourist mobility subsequently affect sustainability outcomes, including environmental quality, carbon reduction, visitor satisfaction, destination competitiveness, and community benefits. Accordingly, this review examines both the direct and indirect relationships among transport decarbonization, tourist mobility, and sustainable tourism.

Particular attention is given to identifying lessons and policy implications that may support sustainable tourism development in Indonesia as a developing archipelagic country facing growing tourism demand and increasing commitments to sustainability transitions.

4. RESULTS AND DISCUSSION

4.1 *Characteristics of Reviewed Studies*

The systematic review analyzed 61 Scopus-indexed journal articles published across a range of geographical and disciplinary contexts. The reviewed studies demonstrate growing academic interest in the relationships among transportation systems, sustainable mobility, transport decarbonization, tourist mobility, and sustainable tourism (Gühnemann et al., 2021; Hussain et al., 2023). Although the selected studies vary in scope and methodological approaches, they collectively highlight the growing importance of mobility transitions in tourism sustainability agendas (Paulino et al., 2025; Starčević et al., 2025).

A substantial proportion of the reviewed literature originates from developed countries, particularly European destinations (Bausch, 2024; Zamparini & Pappadà, 2025). These studies frequently examine sustainable mobility initiatives, public transport systems, accessibility improvements, cycling infrastructure, and low-carbon transportation strategies within tourism contexts (Gutiérrez & Miravet, 2016; Szymańska et al., 2021). Additional contributions originate from Asia, North America, and other regions, reflecting the global relevance of sustainable mobility and tourism-related transportation challenges (Choomanee et al., 2025; Khawjankong & Arreeras, 2026).

The reviewed studies employ diverse methodological approaches, including case studies, surveys, modeling techniques, policy analyses, scenario assessments, and conceptual frameworks (Cattaruzzo et al., 2026; Kulanovic et al., 2026). This methodological diversity indicates that sustainable mobility and transport decarbonization are increasingly recognized as multidisciplinary research fields involving transportation studies, tourism management, environmental sustainability, urban planning, and public policy (Hussain et al., 2023; Urban et al., 2024).

The thematic synthesis identified five dominant themes. These include: (1) Sustainable Mobility and Transport Decarbonization, (2) Tourist Mobility and Accessibility, (3) Public Transport and Destination Connectivity, (4) Sustainable Tourism Outcomes, and (5) Policy and Governance (Choomanee et al., 2025; Paulino et al., 2025). While each theme has developed its own body of literature, the review reveals strong interconnections among them. In particular, tourist mobility consistently emerges as a critical mechanism linking transportation interventions with broader sustainability outcomes (Hussain et al., 2023; Zamparini et al., 2025).

The findings further suggest that transportation is no longer viewed merely as supporting infrastructure for tourism activities (Bausch, 2024; Gühnemann et al., 2021). Instead, transportation systems increasingly influence destination accessibility, visitor experiences, environmental performance, and long-term tourism competitiveness (Iamtrakul et al., 2025; Prideaux, 2000). This shift reflects a broader transition from transport-centered approaches toward integrated mobility frameworks that recognize the strategic role of transportation in achieving sustainable tourism development (Hussain et al., 2023).

4.2 *Sustainable Mobility and Transport Decarbonization*

Sustainable mobility and transport decarbonization emerged as one of the most prominent themes across the reviewed literature (Choomanee et al., 2025; Paulino et al., 2025). The findings

indicate that researchers increasingly view transportation sustainability as a multidimensional transition involving environmental, social, economic, and behavioral dimensions rather than merely a technological challenge (Henke et al., 2020; Hussain et al., 2023). While early discussions of transport decarbonization primarily focused on emissions reduction and energy efficiency, recent studies have broadened the debate to encompass accessibility, mobility behavior, transport equity, and destination sustainability (Urban et al., 2024).

A recurring finding across the reviewed studies is that transport decarbonization cannot be achieved solely through technological innovation (Gühnemann et al., 2021; Urban et al., 2024). Although electric vehicles, alternative fuels, and energy-efficient transport systems remain important components of emission reduction strategies, many studies emphasize that long-term sustainability requires broader changes in mobility systems (Paulino et al., 2025; Waleghwa, 2025). These changes include reducing dependence on private vehicles, encouraging modal shifts toward public transportation, promoting active mobility, and improving transport accessibility.

The literature further highlights the growing importance of sustainable mobility as a framework for achieving transport decarbonization objectives (Hussain et al., 2023; Starčević et al., 2025). Sustainable mobility approaches emphasize the movement of people rather than vehicles. Consequently, policy interventions increasingly focus on improving accessibility, enhancing public transport services, encouraging walking and cycling, and developing integrated mobility systems that reduce transport-related environmental impacts while meeting mobility needs (Khawjankong & Arreeras, 2026; Szymańska et al., 2021).

Several studies identify public transportation as one of the most effective mechanisms for decarbonizing transportation. Public transport systems can reduce traffic congestion, lower per-capita emissions, and improve accessibility within tourism destinations (Choomanee et al., 2025; Henke, 2020). Similarly, active mobility initiatives, such as walking and cycling infrastructure, are frequently associated with environmental benefits and enhanced visitor experiences (Daniele et al., 2023; Philips et al., 2024). More recent studies also highlight the emergence of micromobility solutions, including shared bicycles and electric scooters, as complementary strategies supporting low-carbon mobility transitions (Khawjankong & Arreeras, 2026; Szymańska et al., 2021).

Beyond environmental outcomes, the reviewed literature suggests that sustainable mobility generates broader co-benefits. These include improved public health, enhanced urban livability, increased social inclusion, and greater destination attractiveness (Hussain et al., 2023; Rosa-Jiménez et al., 2023). In tourism contexts, sustainable mobility initiatives can improve destination accessibility, facilitate visitor movement, and contribute to more positive tourism experiences (Bausch, 2024; Jaffar et al., 2025). Consequently, transport decarbonization is increasingly viewed not only as an environmental necessity but also as a strategic component of destination development (Paulino et al., 2025; Zamparini & Pappadà, 2025).

Despite these advances, several challenges remain evident within the literature. Many destinations continue to experience strong dependence on private vehicles, limited public transport coverage, fragmented mobility systems, and insufficient integration between transportation and tourism planning (Khawjankong & Arreeras, 2026; Waleghwa, 2025). These barriers often reduce the effectiveness of decarbonization initiatives and limit their contribution to sustainable tourism objectives (Choomanee et al., 2025; Gühnemann et al., 2021).

An important observation emerging from the reviewed studies is that transport decarbonization and sustainable mobility are frequently discussed in transportation and environmental research but are less commonly directly linked to tourism outcomes (Hopkins, 2020; Paulino et al., 2025). While numerous studies evaluate emission-reduction potential, mobility efficiency, and transport policy effectiveness, fewer examine how these interventions influence tourist mobility patterns and destination sustainability. This finding reinforces the argument that greater integration between transportation and tourism research remains necessary (Hussain et al., 2023; Zamparini & Pappadà, 2025).

Overall, the literature demonstrates that sustainable mobility and transport decarbonization represent interconnected processes rather than separate policy agendas (Kulanovic, 2025; Urban

et al., 2024). Effective decarbonization requires not only technological innovation but also transformations in mobility behavior, transport accessibility, and governance systems (Gühnemann et al., 2021; Khawjankong & Arreeras, 2026). Within tourism destinations, these transformations create opportunities to simultaneously reduce environmental impacts and enhance tourism sustainability, thereby positioning mobility transitions as a critical pathway toward low-carbon tourism development (Bausch, 2024; Rahman et al., 2025).

4.3 Tourist Mobility and Accessibility

Tourist mobility and accessibility emerged as one of the most frequently discussed themes across the reviewed literature. While transportation studies have traditionally focused on infrastructure provision and mobility efficiency, recent tourism research increasingly recognizes mobility as a fundamental determinant of destination performance and sustainability. The reviewed studies consistently demonstrate that tourism is inseparable from mobility, as visitors' ability to access and move within destinations directly influences tourism experiences, destination attractiveness, and competitiveness (Gühnemann et al., 2021; Prideaux, 2000).

The literature conceptualizes tourist mobility as a multidimensional phenomenon encompassing not only physical movement but also travel behavior, transportation choices, perceptions of accessibility, route selection, and interactions with destination infrastructure. Consequently, tourist mobility extends beyond transportation itself and becomes an integral component of the overall tourism experience (Cattaruzzo et al., 2026; Hussain et al., 2023). Several studies emphasize that mobility conditions influence how tourists perceive destinations, interact with attractions, and evaluate the quality of their travel experiences (Iamtrakul et al., 2025; Thompson & Schofield, 2007).

Accessibility emerged as a central dimension within the tourist mobility literature. Accessible destinations enable visitors to reach tourism attractions efficiently, reduce travel uncertainty, and enhance overall satisfaction (Gronau & Kagermeier, 2007; Paulino et al., 2025). The reviewed studies suggest that accessibility is influenced by various factors, including transportation availability, network connectivity, service quality, affordability, safety, and information accessibility (Hussain et al., 2023; Iamtrakul et al., 2025). Destinations characterized by efficient and integrated mobility systems tend to demonstrate stronger tourism performance and higher visitor satisfaction levels.

The findings further indicate that transportation choices play a significant role in shaping tourist mobility patterns. Public transportation systems, active mobility options, shared mobility services, and multimodal transport networks influence how tourists navigate destinations and access tourism resources (Cattaruzzo et al., 2026; Paulino et al., 2025). In particular, studies focusing on sustainable mobility consistently highlight the importance of providing attractive alternatives to private vehicle use. Such alternatives not only improve mobility efficiency but also contribute to environmental sustainability objectives (Bausch, 2024; Hussain et al., 2023).

A notable trend identified in the reviewed literature is the growing attention to the behavioral dimensions of tourist mobility. Rather than viewing mobility solely as a logistical issue, researchers increasingly examine how tourists make transportation decisions and respond to mobility interventions (Daniele et al., 2023; Gühnemann et al., 2021). Factors such as convenience, comfort, travel time, environmental awareness, and destination characteristics influence transportation preferences and mode choices. This perspective suggests that mobility transitions require not only infrastructure improvements but also behavioral changes among tourists (Khawjankong & Arreeras, 2026; Waleghwa, 2025).

The literature also reveals that tourist mobility functions as a critical intermediary mechanism linking transportation systems and tourism outcomes (Hussain et al., 2023; Zamparini & Pappadà, 2025). Transport interventions such as public transport improvements, active mobility infrastructure, and low-carbon mobility initiatives do not directly generate tourism benefits. Instead, their effects are mediated through changes in accessibility, travel behavior, and mobility patterns (Cattaruzzo et al., 2026). Improved mobility enables visitors to access a wider range of

attractions, experience destinations more efficiently, and engage more deeply with local environments. Consequently, mobility serves as the pathway through which transportation investments contribute to tourism development.

Another important finding concerns the relationship between mobility and destination competitiveness. Several studies suggest that destinations offering efficient, convenient, and sustainable mobility systems are increasingly perceived as attractive by visitors (Gühnemann et al., 2021; Prideaux, 2000). As tourist expectations evolve, mobility quality becomes an important element of destination image and tourism competitiveness. Destinations capable of integrating accessibility, sustainability, and visitor convenience may therefore gain a competitive advantage in increasingly sustainability-conscious tourism markets (Bausch, 2024; Rigelsky & Mikeska, 2023).

Despite the growing importance of tourist mobility, the reviewed literature reveals several persistent challenges. Many destinations continue to face issues related to inadequate transport connectivity, fragmented mobility systems, dependence on private vehicles, and unequal accessibility across tourism areas (Choomanee et al., 2025; Paulino et al., 2025). These challenges are particularly significant in geographically dispersed destinations where transportation networks play a critical role in facilitating tourism activities (Jaffar et al., 2025; Rendeiro Martín-Cejas & Ramírez Sánchez, 2021).

The findings further indicate that studies examining tourist mobility often remain disconnected from broader transport decarbonization debates. While mobility research frequently focuses on accessibility and visitor experiences, transport decarbonization studies tend to emphasize environmental outcomes and technological solutions (Hopkins, 2020; Zamparini & Pappadà, 2025). As a result, opportunities to understand how low-carbon transport strategies influence tourist mobility remain relatively underexplored (Hussain et al., 2023).

Overall, the reviewed literature demonstrates that tourist mobility is more than a transportation issue; it serves as a strategic mechanism by which transportation systems influence tourism sustainability outcomes (Hussain et al., 2023; Zamparini & Pappadà, 2025). This finding supports the argument that tourist mobility should be positioned at the center of efforts to integrate transport decarbonization and sustainable tourism development (Bausch, 2024; Gühnemann et al., 2021). Consequently, understanding mobility dynamics is essential for designing transportation policies that simultaneously advance environmental objectives and tourism sustainability goals (Choomanee et al., 2025; Paulino et al., 2025).

4.4 Public Transport and Destination Connectivity

Public transport and destination connectivity constitute another major theme emerging from the reviewed literature. Across diverse geographical contexts, public transportation is consistently identified as a critical component of sustainable mobility systems that can improve accessibility, reduce private vehicle dependence, and support sustainable tourism development (Hussain et al., 2023; Paulino et al., 2025). The reviewed studies demonstrate that transportation infrastructure and service quality significantly influence tourists' ability to access destinations and move efficiently between attractions (Iamtrakul et al., 2025; Thompson & Schofield, 2007).

The literature highlights that destination connectivity extends beyond physical infrastructure. Connectivity encompasses the effectiveness of transportation networks in linking tourists with destinations, attractions, accommodation facilities, and supporting services. Consequently, well-connected destinations are generally more accessible, attractive, and competitive within tourism markets. Several studies indicate that transportation connectivity influences destination choice, visitor movement patterns, and overall tourism experiences (Bausch, 2024; Prideaux, 2000).

Public transportation emerged as one of the most frequently discussed strategies for improving destination connectivity. Bus networks, rail systems, shuttle services, and integrated multimodal transport systems are commonly identified as mechanisms that can reduce travel barriers and improve visitor accessibility (Paulino et al., 2025; Rendeiro Martín-Cejas & Ramírez Sánchez, 2021). In addition to facilitating tourist movement, public transport systems contribute

to environmental objectives by reducing congestion, lowering emissions, and decreasing dependence on private vehicles (Choomanee et al., 2025; Henke et al., 2020).

The reviewed literature further suggests that public transportation plays an important role in shaping tourist behavior. Reliable and accessible public transport services can encourage visitors to adopt more sustainable travel modes while reducing reliance on private cars (Bausch et al., 2024; Hussain et al., 2023). This shift contributes not only to environmental sustainability but also to improved mobility efficiency within tourism destinations. In several cases, destinations with well-developed public transportation systems exhibit higher visitor satisfaction due to improved convenience and accessibility (Cattaruzzo et al., 2026; Thompson & Schofield, 2007).

An important finding concerns the relationship between destination connectivity and tourism competitiveness. Connectivity enables tourists to access a wider range of attractions, distribute visitor flows more evenly, and extend tourism activities beyond core tourism zones (Gutiérrez & Miravet, 2016; Iamtrakul et al., 2025). Consequently, transportation networks influence not only visitor mobility but also broader patterns of tourism development. Improved connectivity may support regional tourism growth, enhance economic opportunities for local communities, and reduce spatial inequalities within destinations (Gavurova et al., 2023; Prideaux, 2000).

The literature also emphasizes the growing importance of integrated transport systems. Rather than relying on a single mode of transportation, many destinations increasingly promote multimodal mobility solutions that integrate public transport, walking infrastructure, cycling facilities, and shared mobility services (Khawjankong & Arreeras, 2026; Szymańska et al., 2021). Such integration improves travel flexibility and allows tourists to move more efficiently across destinations. Integrated mobility systems are therefore frequently associated with both improved visitor experiences and enhanced sustainability outcomes (Hussain et al., 2023; Paulino et al., 2025).

Despite these benefits, the reviewed studies identify several challenges limiting the effectiveness of public transport and destination connectivity initiatives. Common barriers include inadequate transport coverage, fragmented transport networks, inconsistent service quality, limited intermodal integration, and insufficient coordination between transportation and tourism authorities (Khawjankong & Arreeras, 2026; Paulino et al., 2025). These challenges often reduce the attractiveness of public transport alternatives and reinforce dependence on private vehicles.

The literature further reveals that connectivity challenges are particularly pronounced in geographically dispersed destinations. Regions characterized by complex spatial structures, peripheral tourism areas, and uneven infrastructure development often struggle to provide efficient mobility systems (Gühnemann et al., 2021; Rendeiro Martín-Cejas & Ramírez Sánchez, 2021). Such conditions may restrict accessibility, reduce tourism opportunities, and undermine sustainability objectives. These findings are especially relevant for archipelagic countries where transportation networks play a critical role in connecting tourism destinations (Jaffar et al., 2025).

Overall, the reviewed studies demonstrate that public transport and destination connectivity represent fundamental components of sustainable tourism development. Beyond their transportation functions, these systems influence accessibility, visitor experiences, environmental performance, and destination competitiveness (Hussain et al., 2023; Prideaux, 2000). Consequently, strengthening public transport systems and improving destination connectivity should be viewed as strategic priorities for destinations seeking to advance both mobility sustainability and tourism development objectives.

4.5 Sustainable Tourism Outcomes

The reviewed literature consistently demonstrates that transportation systems and mobility patterns have significant implications for sustainable tourism outcomes. While transport decarbonization initiatives are often evaluated based on their environmental performance, the findings suggest that their impacts extend far beyond emission reduction (Gühnemann et al., 2021; Hussain et al., 2023). Sustainable mobility interventions influence multiple dimensions of tourism

sustainability, including environmental quality, visitor satisfaction, destination competitiveness, community well-being, and long-term destination resilience (Iamtrakul et al., 2025; Prideaux, 2000).

One of the most frequently discussed outcomes concerns environmental sustainability. The reviewed studies indicate that sustainable mobility strategies, such as improvements to public transportation, active mobility infrastructure, and low-carbon transport systems, help reduce transport-related emissions and environmental pressures in tourism destinations (Choomanee et al., 2025; Rahman et al., 2025). By encouraging shifts away from private vehicle use, these interventions help reduce congestion, improve air quality, and mitigate the environmental impacts associated with tourism growth (Cartenì et al., 2020; Khawjankong & Arreeras, 2026). Consequently, transport decarbonization is increasingly recognized as an important component of destination-level climate action and sustainability planning.

Beyond environmental benefits, the literature highlights the influence of mobility systems on visitor experiences and satisfaction. Accessibility, travel convenience, and mobility efficiency shape how tourists interact with destinations and evaluate their travel experiences (Kim et al., 2024b; Thompson & Schofield, 2007). Destinations that provide reliable public transport, integrated mobility services, and accessible transportation networks often report higher levels of visitor satisfaction (Bausch, 2024; Cattaruzzo et al., 2026). In contrast, mobility constraints, congestion, and poor connectivity may negatively affect destination perceptions and overall tourism experiences (Curtale et al., 2024; Waleghwa, 2025).

Another important outcome identified in the literature is destination competitiveness. Sustainable mobility systems contribute to destination attractiveness by improving accessibility and enhancing the overall quality of tourism services (Gühnemann et al., 2021; Iamtrakul et al., 2025). As sustainability becomes an increasingly important consideration for travelers, destinations that successfully integrate mobility sustainability into tourism planning may gain competitive advantages in both domestic and international tourism markets (Bausch, 2024; Jaffar et al., 2025). Several studies suggest that mobility quality is becoming an integral component of destination image and tourism branding strategies (Khawjankong & Arreeras, 2026; Prideaux, 2000).

The reviewed studies also emphasize the social dimensions of sustainable tourism outcomes. Improved mobility systems can enhance inclusivity by expanding access to tourism opportunities for diverse visitor groups, including older adults, people with disabilities, and individuals without access to private vehicles (Paulino et al., 2025; Rosa & Lopes, 2023). Furthermore, sustainable mobility initiatives may support local communities by reducing traffic-related disruptions, improving public spaces, and promoting healthier, more livable environments (Cartenì et al., 2020; Rosa-Jiménez et al., 2023). These benefits demonstrate that mobility transitions can contribute simultaneously to tourism development and broader societal well-being (Hussain et al., 2023; Kim et al., 2024b).

An additional finding concerns the relationship between mobility and the spatial distribution of tourism benefits. Efficient transportation networks allow tourists to access a wider range of attractions beyond traditional tourism hotspots (Cattaruzzo et al., 2026; Iamtrakul et al., 2025). Improved connectivity may therefore contribute to a more balanced distribution of visitor flows, reducing pressure on overcrowded destinations while generating economic opportunities for peripheral areas (Gálvez-Pérez et al., 2024; Rendeiro Martín-Cejas & Ramírez Sánchez, 2021). This outcome is particularly important for destinations seeking to promote regional tourism development and reduce spatial inequalities (Jaffar et al., 2025; Rigelsky & Mikeska, 2023).

Despite these positive outcomes, the literature indicates that transport interventions do not automatically generate the benefits of sustainable tourism. The effectiveness of mobility initiatives depends on multiple contextual factors, including governance capacity, infrastructure quality, stakeholder collaboration, policy coherence, and user acceptance (Hussain et al., 2023; Khawjankong & Arreeras, 2026). In several cases, transport decarbonization measures failed to achieve their intended outcomes due to inadequate implementation, limited accessibility, or insufficient integration with tourism planning objectives (Paulino et al., 2025; Waleghwa, 2025).

The findings further suggest that sustainable tourism outcomes emerge through indirect pathways rather than direct causal relationships. Transport decarbonization initiatives influence accessibility, mode choice, and travel behavior, which subsequently affect visitor experiences, environmental performance, and destination competitiveness (Cattaruzzo et al., 2026; Iamtrakul et al., 2025). This observation reinforces the role of tourist mobility as a critical intermediary mechanism linking transportation systems and tourism sustainability outcomes (Hussain et al., 2023; Zamparini, 2025).

Overall, the reviewed literature demonstrates that sustainable tourism outcomes are multidimensional and interconnected (Hussain et al., 2023; Rahman et al., 2025). Environmental quality, visitor satisfaction, destination competitiveness, social inclusion, and community well-being are closely influenced by transportation systems and mobility patterns (Gühnemann et al., 2021; Paulino et al., 2025). Consequently, transport decarbonization and sustainable mobility should not be viewed solely as transportation objectives but as strategic instruments that support broader sustainable tourism development goals.

4.6 Policy and Governance

Policy and governance emerged as one of the most influential themes across the reviewed literature. While sustainable mobility and transport decarbonization are often associated with technological innovation and infrastructure development, the findings indicate that governance arrangements ultimately determine the effectiveness of these initiatives. Successful mobility transitions depend not only on transport technologies but also on institutional capacity, policy coherence, stakeholder coordination, and long-term strategic planning (Hussain et al., 2023; Stanford & Guiver, 2016).

The reviewed studies consistently emphasize the importance of integrated policy approaches. Sustainable mobility, transport decarbonization, and tourism development are frequently governed by separate institutions operating under different policy frameworks. This fragmentation often results in inconsistent objectives, duplicated efforts, and reduced policy effectiveness (Gühnemann et al., 2021; Stanford & Guiver, 2016). Consequently, many scholars argue that transportation and tourism policies should be developed within a coordinated framework that aligns environmental, mobility, and tourism goals (Kulanovic et al., 2026; Zamparini et al., 2025).

A recurring finding within the literature is the growing need for cross-sectoral collaboration. Sustainable mobility transitions require cooperation among transportation authorities, tourism agencies, local governments, private-sector actors, and community stakeholders. Effective collaboration enables the development of integrated transport systems, coordinated infrastructure investments, and mobility strategies that respond to both sustainability and tourism objectives (Choomanee et al., 2025; Paulino et al., 2025). Conversely, weak institutional coordination often limits implementation capacity and reduces the effectiveness of mobility interventions (Khawjankong & Arreeras, 2026).

The literature further highlights the role of governance in shaping public acceptance of sustainable mobility initiatives. Transport decarbonization strategies frequently require behavioral changes among users, including shifts from private vehicles to public transport or active mobility alternatives (Gühnemann et al., 2021; Waleghwa, 2025). Such transitions may face resistance if policies fail to address user needs, accessibility concerns, or perceptions of convenience. As a result, stakeholder engagement and participatory planning are increasingly recognized as essential components of successful mobility transitions (Stanford & Guiver, 2016).

Another important theme concerns the relationship between governance quality and policy implementation. Several studies suggest that well-designed sustainability policies do not automatically translate into successful outcomes, as institutional capacity, regulatory consistency, and administrative coordination significantly influence the effectiveness of implementation (Hussain et al., 2023; Paulino et al., 2025). Destinations with strong governance systems are

generally better positioned to integrate transport sustainability objectives into broader tourism development strategies (Stanford & Guiver, 2016; Zamparini et al., 2025).

The reviewed studies also indicate that policy integration is becoming increasingly important in tourism destinations. Traditional tourism planning often focuses on marketing and visitor management, while transportation planning concentrates on mobility efficiency and infrastructure development (Paulino et al., 2025; Scuttari et al., 2013). However, the growing emphasis on sustainability requires closer integration between these policy domains. Several studies argue that sustainable tourism objectives cannot be achieved without simultaneously addressing transportation systems and mobility patterns (Hussain et al., 2023; Iamtrakul et al., 2025).

The governance challenges identified in the literature are particularly relevant for developing countries. Limited financial resources, fragmented institutional structures, uneven infrastructure development, and competing policy priorities frequently constrain the implementation of sustainable mobility initiatives (Mahadevia et al., 2024; Paulino et al., 2025). These conditions may reduce the effectiveness of transport decarbonization strategies and limit their contribution to tourism sustainability objectives. Consequently, governance capacity becomes a critical determinant of long-term success (Hussain et al., 2023).

For Indonesia, the governance dimension is especially important. As an archipelagic nation with diverse tourism destinations and complex transportation challenges, Indonesia requires coordinated approaches that integrate transportation, environmental, and tourism policies (Rahman et al., 2025; Suryawan et al., 2025c). Sustainable mobility initiatives cannot be implemented effectively through isolated sectoral interventions. Instead, achieving meaningful progress requires collaboration across multiple levels of government, engagement with private-sector stakeholders, and alignment between national sustainability goals and local tourism development priorities (Fatina et al., 2023; Wisnumurti et al., 2020).

Overall, the reviewed literature demonstrates that policy and governance serve as enabling conditions for sustainable mobility transitions (Kulanovic et al., 2026; Stanford & Guiver, 2016). Technological innovation, transport infrastructure, and mobility services can contribute to sustainability objectives only when supported by coherent policies and effective governance systems. Therefore, governance should be regarded not as a supporting factor but as a central component of efforts to link transport decarbonization, tourist mobility, and sustainable tourism development (Hussain et al., 2023; Paulino et al., 2025).

4.7 Proposed Conceptual Framework for Indonesia

The synthesis of 61 reviewed articles demonstrates that sustainable mobility, transport decarbonization, tourist mobility, destination connectivity, and governance are closely interconnected components of sustainable tourism development. While previous studies have often examined these themes separately, the findings of this review suggest that they should be understood as part of an integrated system in which transportation interventions influence tourism sustainability through changes in mobility patterns (Hussain et al., 2023; Paulino et al., 2025).

A key finding emerging from this review is the central role of tourist mobility. The literature consistently indicates that transport decarbonization initiatives do not directly generate sustainable tourism outcomes. Instead, their impacts are mediated through changes in accessibility, travel behavior, transportation choices, and destination connectivity (Hussain et al., 2023; Zamparini et al., 2025). In other words, tourist mobility functions as the primary mechanism through which transportation systems influence environmental performance, visitor experiences, and destination competitiveness (Cattaruzzo et al., 2026).

Based on the reviewed studies, this paper proposes a conceptual framework that positions sustainable mobility and transport decarbonization as enabling conditions for tourism sustainability. Strategies such as public transport improvement, active mobility promotion, micromobility development, accessibility enhancement, and low-carbon transportation policies influence how tourists access and move within destinations (Khawjankong & Arreeras, 2026;

Szymańska et al., 2021). These mobility changes subsequently affect tourism sustainability outcomes through multiple pathways.

The framework further recognizes that transportation interventions operate within broader governance and policy environments. Institutional capacity, stakeholder collaboration, policy integration, and long-term planning influence the effectiveness of sustainable mobility initiatives and determine the extent to which transportation systems contribute to tourism sustainability (Hussain et al., 2023; Stanford & Guiver, 2016). Consequently, governance serves as a cross-cutting factor shaping relationships among transportation systems, mobility patterns, and tourism outcomes.

For Indonesia, this framework is particularly relevant. As an archipelagic country with geographically dispersed tourism destinations, uneven transportation connectivity, and diverse regional development conditions, mobility is a critical determinant of tourism performance. Many destinations continue to face accessibility challenges, dependence on private vehicles, and fragmented transportation systems (Rahman et al., 2025; Suryawan et al., 2025b). These conditions suggest that sustainable tourism development cannot be achieved solely through destination management initiatives but requires integrated transportation and mobility strategies (Fatina et al., 2023; Tussadiah et al., 2021).

The proposed framework suggests that sustainable tourism development in Indonesia should be approached through four interconnected dimensions. First, transport decarbonization strategies should promote low-carbon transportation systems that reduce environmental impacts while maintaining accessibility (Gühnemann et al., 2021; Urban et al., 2024). Second, sustainable mobility initiatives should improve connectivity and provide attractive alternatives to private vehicle use (Khawjankong & Arreeras, 2026; Szymańska et al., 2021). Third, transportation policies should prioritize tourist mobility by enhancing accessibility, travel convenience, and destination connectivity (Iamtrakul et al., 2025; Prideaux, 2000). Finally, governance systems should facilitate collaboration among transportation authorities, tourism agencies, local governments, private-sector actors, and local communities (Hussain et al., 2023; Stanford & Guiver, 2016).

Based on these findings, the relationship among the reviewed themes can be summarized as follows:

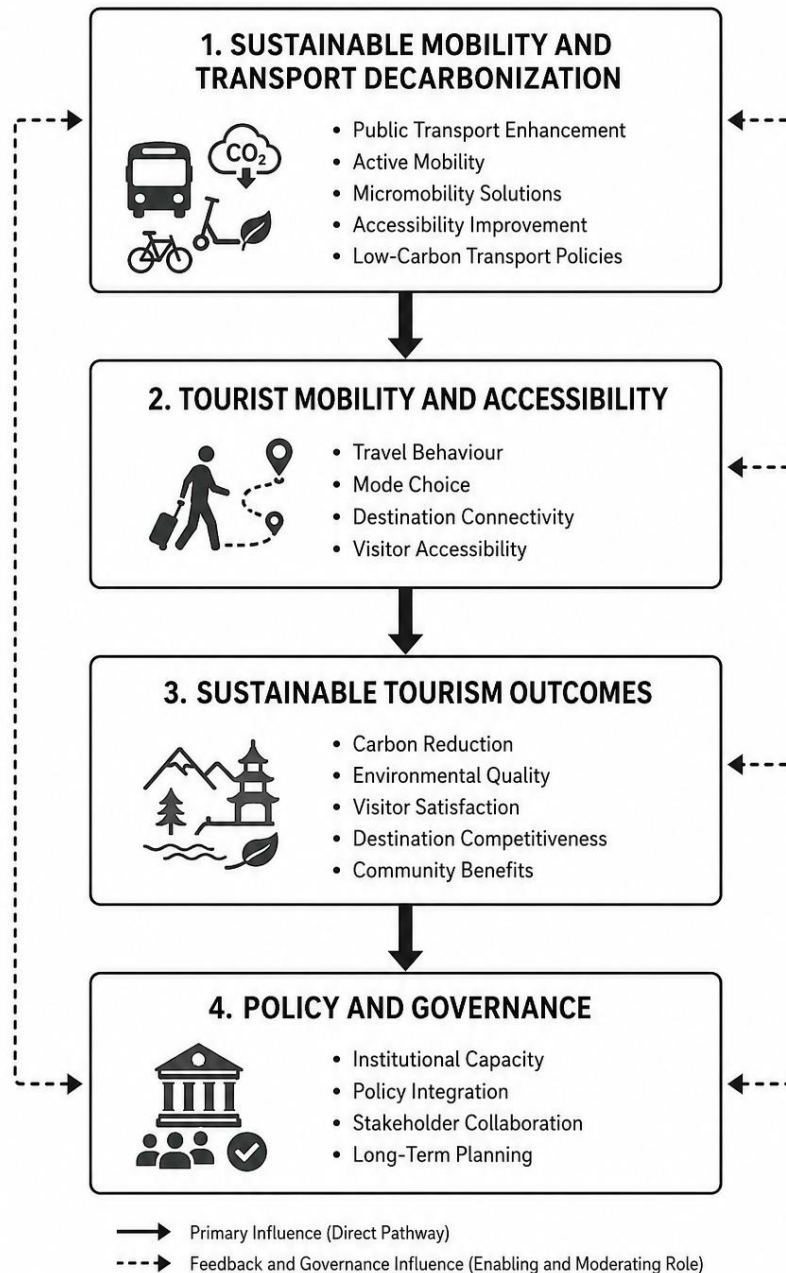


Figure 1. Proposed Conceptual Framework for Linking Road Transport Decarbonization, Tourist Mobility and Sustainable Tourism in Indonesia

The framework highlights that sustainable tourism outcomes are not produced by transportation interventions alone. Rather, they emerge through complex interactions among mobility systems, tourist behavior, accessibility conditions, and governance arrangements. Therefore, future tourism policies should place greater emphasis on mobility transitions as a strategic pathway toward sustainable tourism development.

Overall, the proposed framework contributes to the literature by integrating transport decarbonization, tourist mobility, and sustainable tourism within a single analytical perspective. It also provides a foundation for future research and policy development, particularly in

developing archipelagic countries such as Indonesia, where transportation connectivity remains a critical challenge for tourism sustainability.

5. CONCLUSION AND POLICY IMPLICATIONS

This study systematically reviewed 61 Scopus-indexed journal articles to examine the relationships among road transport decarbonization, tourist mobility, and sustainable tourism development. The review was motivated by the growing recognition that transportation systems play a critical role in achieving sustainability objectives while simultaneously supporting tourism development. Although transport decarbonization, sustainable mobility, tourist mobility, and sustainable tourism have attracted increasing scholarly attention, the literature remains fragmented, with these themes often examined as separate domains. By synthesizing evidence across the reviewed studies, this paper provides a more integrated understanding of how transportation interventions contribute to sustainable tourism outcomes.

The findings reveal five dominant themes within the literature: Sustainable Mobility and Transport Decarbonization, Tourist Mobility and Accessibility, Public Transport and Destination Connectivity, Sustainable Tourism Outcomes, and Policy and Governance. Together, these themes illustrate that mobility systems and transportation policies strongly influence sustainable tourism development. The review demonstrates that contemporary transport sustainability debates extend beyond technological innovation and emission reduction, encompassing broader issues of accessibility, travel behavior, connectivity, and governance. Consequently, transportation should be viewed not merely as supporting infrastructure but as a strategic component of sustainable tourism development.

Regarding the first research question, the review confirms that sustainable and tourist mobility have become central areas of scholarly attention in transportation and tourism research. The literature increasingly emphasizes integrated mobility systems, enhanced public transport, active mobility, and accessibility improvements as key strategies to address environmental challenges while maintaining tourism competitiveness. These findings indicate a gradual shift from transport-centered approaches toward mobility-centered perspectives that prioritize accessibility and user experiences.

Regarding the second research question, the review demonstrates that road transport decarbonization influences sustainable tourism outcomes primarily through changes in tourist mobility. Transport interventions such as public transportation improvements, active mobility infrastructure, micromobility solutions, and low-carbon transport policies affect how tourists access destinations, move between attractions, and make transportation choices. These mobility changes subsequently influence environmental quality, visitor satisfaction, destination competitiveness, and community well-being. The findings therefore suggest that tourist mobility functions as a critical intermediary mechanism linking transportation systems and tourism sustainability outcomes.

The review also highlights that public transport and destination connectivity play particularly important roles within this relationship. Well-connected destinations supported by efficient and accessible transport systems are generally better positioned to attract visitors, enhance tourism experiences, and reduce environmental pressures associated with dependence on private vehicles. At the same time, sustainable mobility initiatives contribute to broader sustainability objectives by reducing emissions, improving accessibility, and enhancing destination livability. These outcomes demonstrate that transportation policies can generate multiple benefits extending beyond environmental performance alone.

In addressing the third research question, the review underscores the importance of policy and governance as enabling conditions for successful mobility transitions. Sustainable mobility initiatives require integrated planning, institutional coordination, stakeholder collaboration, and long-term policy commitment. The literature consistently indicates that technological solutions alone are insufficient to achieve sustainability objectives. Instead, effective governance

frameworks are necessary to align transportation, environmental, and tourism policies within a common sustainability agenda.

This study contributes to the literature by proposing an integrated conceptual framework that links transport decarbonization, tourist mobility, and sustainable tourism outcomes. While previous studies have frequently examined these themes independently, the proposed framework positions tourist mobility as the key mechanism through which transportation interventions influence tourism sustainability. This perspective provides a more comprehensive understanding of the interactions among transportation systems, mobility patterns, and tourism development, thereby contributing to ongoing discussions regarding sustainable mobility transitions.

The findings also offer several policy implications for Indonesia. As an archipelagic country characterized by geographically dispersed tourism destinations, uneven transport connectivity, and growing tourism demand, Indonesia faces unique mobility challenges that directly affect tourism sustainability. Improving public transportation systems, strengthening destination connectivity, promoting active and low-carbon mobility options, and integrating transportation planning with tourism development strategies should therefore become key policy priorities. Furthermore, efforts to reduce transport-related emissions should be accompanied by measures that enhance accessibility and improve visitor mobility experiences.

From a governance perspective, stronger collaboration among transportation agencies, tourism authorities, local governments, private-sector stakeholders, and local communities is essential. Sustainable tourism development requires coordinated approaches that align mobility objectives with broader environmental and economic development goals. Such coordination is particularly important in Indonesia, where tourism destinations vary significantly in terms of accessibility, infrastructure quality, and institutional capacity.

Despite its contributions, this study has several limitations. The review relied exclusively on Scopus-indexed English-language journal articles, potentially excluding relevant studies from other databases and languages. In addition, the analysis focused primarily on thematic synthesis rather than quantitative meta-analysis. Future research may expand the scope of review sources, employ bibliometric techniques, or conduct empirical investigations examining the relationships among transport decarbonization, tourist mobility, and sustainable tourism within specific destinations.

In conclusion, the findings demonstrate that sustainable tourism development is inseparable from transportation sustainability. Road transport decarbonization, sustainable mobility, tourist mobility, destination connectivity, and governance form an interconnected system that shapes tourism outcomes. For Indonesia and other developing countries, mobility transitions should be viewed not only as environmental strategies but also as pathways toward more competitive, accessible, and sustainable tourism development. The proposed framework provides a foundation for future research and policy initiatives to advance low-carbon, sustainable tourism in increasingly mobility-dependent destinations.

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