

# Exploring Sustainable Urban Mobility, Non-Motorized Transport and Electric Public Transit in Tourism: A Conceptual Perspective

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## Abstract

Transportation plays a major role in tourism industry. However, the greenhouse gasses emissions from the vehicle can cause global warming and climate change. Therefore, in this article, the sustainable transportation options are explored to see the influence of sustainable transportation towards the tourism industry. One of the objectives of this article is to examine how urban mobility initiatives have influenced the development of sustainable transport alternatives in cities dependent on tourism. This article used the process of systematic literature review as the methodology. The discussion on the article is the expanded research on urban mobility, non-motorized transportation, and electric public transport and its influences in tourism industry. The conclusion is that transportation and tourism are interrelated and policies regarding green transportation must be enforced to reduce the impact of transportation towards environment.

**Keywords:** Tourism, Transportation, Green Transportation, Urban Mobility

## Introduction

### *Background of Study*

The idea of tourism-led development implies that international tourism may help to generate income and promote economic development by means of better quality and efficiency of tourist operations as well as the application of economies of scale (Qamruzzaman, 2023). The necessity to lower carbon dioxide emissions and fossil fuel usage emphasizes the significance of adopting renewable energy sources since they greatly affect the surroundings (Guo, Zhao and Zhang, 2023). Utilizing renewable energy resources is crucial for implementing sustainable practices. The utilization of renewable energy sources not only tackles environmental issues but also corresponds with sustainability objectives. Clean energy serves as both a response to environmental degradation and a proactive strategy to reduce the ecological impact of tourism, fostering a harmonious relationship between the business and its surroundings (Qamruzzaman, 2023). Technological advancements present a chance to

update and modernize the activities, structure, and culture of organizations (Haliza Hamzah et al., 2018).

### **Problem Statement**

Based on the analysis of traveller habits in 160 countries between 2009 and 2013, a study from Lenzen et al (2018), showed that tourism's impact on global emissions is four times higher than previously thought. Tourism contributes to about 8% of global greenhouse gas (GHG) emissions, resulting mainly from the transport and consumption of goods and services, including food and accommodation. Its findings suggest that tourism has turned into a carbon intensive sector and would continue to accelerate local carbon emissions. Another study warns that at least 15% of global tourism-related emissions associated with global aviation are under no binding reduction targets in the Paris Agreement (Lenzen et al. 2018).

The negative externalities of mobility and transport-related tourism activities are not only restricted to global environmental issues, but also generate social and economic impacts at the local level (Koens et al., 2018) (e.g. congestion or overcrowding, low road safety, conflicts in the uses of public spaces between residents and tourists, etc.). These side effects must be tackled by public authorities to reduce the negative environmental externalities, to enhance the experience of tourists and to increase the quality of life and the socioeconomic benefits of the residents (Anton Clavé, 2019).

### **Research Objective**

Despite the increasing scholarly interest in sustainable transportation, there exists a notable deficiency in comprehensive reviews concerning the literature on environmentally friendly transport initiatives within the tourism sector. Consequently, our review addresses the urgent calls for expanded research on urban mobility, non-motorized transportation, and electric public transport and its influences in tourism industry (Gossling & Peeters, 2015; Salam et al. 2022; Sukri et al., 2017). The objective of this article is to systematically organize the literature regarding urban mobility, non-motorized transportation, and electric public transport, focusing on their impacts on the tourism sector by identifying fundamental concepts, functionalities of transport, and research findings. In light of this context, the following objectives are established:

1. Examine how urban mobility initiatives have influenced the development of sustainable transport alternatives in cities dependent on tourism.
2. Analyse the role of transportation infrastructure to accommodate tourist to the attraction destinations and its influence on the overall tourism experience.
3. Identify key trends shaping the future of tourism and transport and evaluate how these trends are being integrated into urban planning for sustainable tourism expansion.

This study offers three pivotal contributions to the academic field. First, it undertakes a synthesis of the current body of research through a meticulous and interdisciplinary analysis of scholarly literature, with a focus on urban mobility engagement within the tourism domain. Subsequently, drawing from the analysis, it highlights significant concepts from the preceding decades that are relevant to the tourism industry, as articulated in the discourse on urban mobility, non-motorized transportation, and electric public transport. Lastly, in the concluding

segment, it combines the primary concepts, identifies critical areas that are shaping the future landscape of tourism and transportation, and proposes chances for future research inquiry.

The following sections of the article are organized in the following manner. Initially, this study provides an elaboration on the methodological framework and research design, detailing the data collection process employed. Subsequently, the principal findings and outcomes will be presented. In the final section, this study will integrate the overarching themes and delineate prospective directions for future scholarly research.

**Methodology**



Figure 1- Systematic Literature Review (SLR) Process

This study employed PRISMA flowchart for the selection process of articles and analysis of systematic literature review. As tabulated in Figure 1, shows the flow of study selection for this study. The PRISMA flowchart acts as a guideline for performing a systematic review. This study adopts PRISMA flowchart because it is useful in reporting the preferred items for a systematic literature review. PRISMA flowchart helps to provide a systematic and strategic flow of information, where in every flow in PRISMA, the record articles identified have a tracking number that is manually filled in by the researcher, inclusion, exclusion, and reasons of exclusions of the articles. There are four flows in PRISMA, which are identification, screening, eligibility, and inclusion.

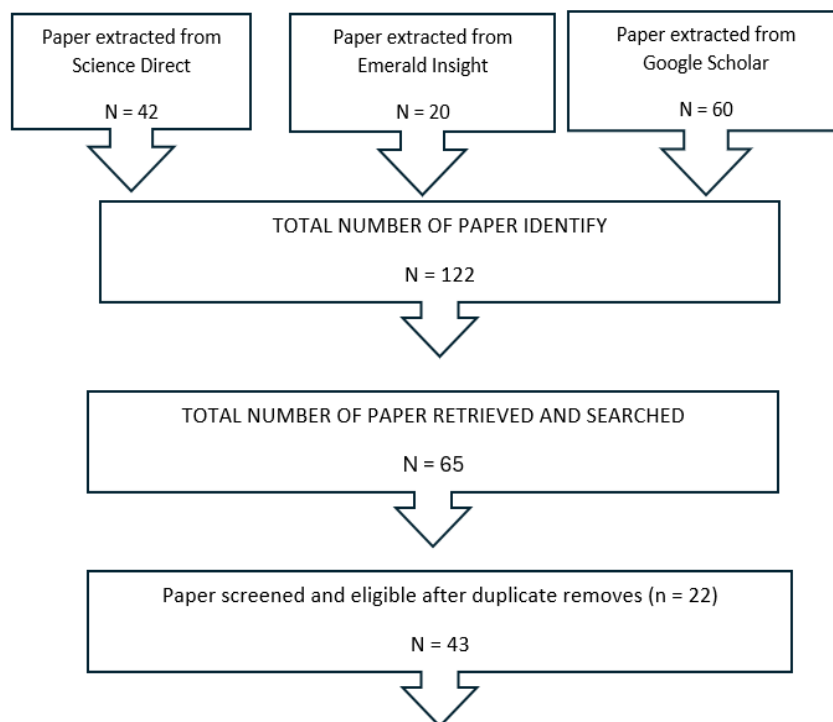


Figure 2 - The procedure for selecting the eligible papers.

The first step is identification, which demonstrates how the researcher searches for the articles for this study. Electronic search space, such as Science Direct, Emerald Insight, and Google Scholar, were explored for this work. As laid out in figure 2, the searching was limited to the documents from the year 2004 until 2024 in the purpose of assessing environmental impacts and achieving global sustainable tourism. Keywords and search strategies were dependent on each database's search engines, in which they were chosen to locate the maximum number of studies. The terms included with reference to the context (transportation, tourism, green transportation, urban mobility, electric vehicle, future of transport), study population (Malaysia, ASEAN, and worldwide), and methodology (qualitative and quantitative), using both Boolean operators AND and OR to do the searching in both title and abstract section.

The example of search string used for this study ("transportation" OR "green transportation" OR "electric vehicle" OR "urban mobility" OR "tourism" OR "future of transport" OR "future or tourism") AND ("characteristic\*" OR "character\*" OR "different\*" OR "differ\*" OR "comparison\*"). Therefore, the search should be extensive enough to ensure including all potential and related papers and, at the same time, the search should also be rigorous enough to ensure only locating relevant documents. A total of 122 articles related to this study have been identified.

#### A. Study Selection

After the process of article identification or article searching from electronic databases, the articles were then removed of its duplicates. The duplicate articles will block the process of selecting the articles required or related and important for the study. The articles then undergo the screening process via their titles and abstracts; unrelated titles and abstracts were excluded from this study. A total of 65 articles were viewed as full-text articles, which are assessed for eligibility and excluded with the reasons stated in the inclusion and exclusion criteria of this study, which totaled 65 articles. Finally, after all the processes, the researcher obtained the total number of articles or papers that are included in this systematic literature review, totaling 43 articles.

#### B. Inclusion and Exclusion Criteria

Table 1

*Inclusion And Exclusion Criteria*

Inclusion:	Exclusion:
Articles were written in English.	Non-social science research paper.
Studies published from 2004 to 2024.	The studies from any journal and data sources seemed to be repeated or duplicated.
The articles mention green transportation, urban mobility and tourism.	Papers do not satisfy the quality criteria.

#### C. Coding Strategy

All the selected studies were analyzed and coded based on database reporting, where searching was conducted, numbers of articles included in each review, and the characteristics of green transport and its relation to the context of tourism. The researcher listed and gathered all the variables in a table from the articles selected using PRISMA

flowchart and viewed by the researcher in total of 43 articles. After identifying articles using PRISMA flowchart, the method continued with the process of analyzing the green transportation initiatives and their influence.

As the researcher has gathered and listed all the green transportation initiatives, the purpose of analyzing the initiatives influence is to establish findings for this study. To analyse the initiatives, the researcher had selected 3 variables that showed more views or mentions given by authors. The variables are urban mobility, transport as tourism and future of tourism and transport.

## **Findings and Discussion**

### *Urban Mobility*

Transport has a crucial role in both the global economy and society (Sahir and Azizan,2019). The growing need for mobility remains a significant obstacle, and this obstacle is affected by the movement of tourists in the tourism industry (Sukri et al., 2017). Urban mobility concept is part of the tourism as tourist move around the urban area for attractions places, food and beverages and finding accommodations. Usage of public transport will be increased if there is no private transportation available in the area.

The rise in traffic loads directly correlates with the growth in safety and health concerns. Transportation activities have detrimental effects on the environment, as carbon dioxide emissions are currently exerting a tangible influence on climate change. The transport sectors play a crucial role in the economy, bolstering both competitiveness and jobs. The tourist in a destination uses public transportation to move from one place to another if there is no private vehicle available. A well-functioning public transport system will indirectly mitigate the use of private vehicles and alleviate associated issues, like elevated accident rates, traffic congestion, and air pollution (Salam et al.,2022), while concurrently expanding the use of public transit among individuals.

Countries have tourism as their economic activities. The economy and the ecology will be affected by an inefficient public transport system because of greenhouse gas emissions. Therefore, it is crucial and feasible to reduce carbon footprints and advocate for eco-friendly public transportation options, such as taxi and bus services (Shafie et al., 2023). Several affluent communities have prioritised the reduction of personal automobile usage by making significant political investments in public transit infrastructure. Nevertheless, a crucial concern related to advocating for these measures is the imperative to guarantee that these transport modes adequately fulfil the requirements of the users and adhere to safety standards (Shafie et al., 2023). Since tourism movement also used transportation to move to destinations, these policies might impact the economic activities in future.

The mobility through urban has already been research in a few Asian countries. Prasarana Sdn. Bhd., organization in Malaysia, has undertaken the task of implementing public transport systems in Kuala Lumpur and Penang as part of its efforts to provide public transport options. The presence of Mass Rapid Transit (MRT), which links many major towns and neighbourhoods in Selangor and Kuala Lumpur, is a step towards creating a smooth and uninterrupted travel experience for individuals. MyRapid has greatly enhanced the public

transport system, namely in the Klang Valley and Penang, where the proportion of public transport usage increased from 16% in 2010 to 20% in 2015. (Yaacob et al., 2020).

Indonesia, on the other hand, has implemented many projects including Green Infrastructure, Green Building, and Green City Development. Indonesia's objective in Green City Development is to attain intelligent transportation. The Green City Development Programme (P2KH) implemented by the Ministry of Public Works and Public Housing in Indonesia aims to incorporate Green Infrastructure (GI) principles in a comprehensive and extensive manner inside urban regions. (Mungkasa, 2020). The endeavour to address environmental concerns was also intertwined with political occurrences. Suharto and his increasing network of economic associates, consisting of the ethnic elite and Chinese-Indonesian allies, directly profited from the policy choices made by the government. (Batubara, Kooy and Zwarteveen, 2018).

Countries are started to practice the development of low carbon city. The objective of low carbon city development is to limit the city's overall carbon footprint by decreasing or eliminating its dependence on fossil fuels energy, while ensuring its economic development potential remains unaffected. (Das, 2019). Meanwhile, in Malaysia, there are multiple obstacles to overcome in order to decrease carbon emissions, particularly in the transportation sector. First and foremost, Malaysia is adopting the loan automobile plan. The banking sector in Malaysia offers various incentives to encourage individuals to purchase cars according to their preferences. The ramifications of this issue will ultimately result in a substantial increase in car ownership (Kamarudin et al., 2022). Malaysia's primary emphasis is on the automotive industry, which ranks as the third largest in Southeast Asia. (Malaysia Automotive Institute, 2017). The National Car Project, Proton, was initiated in the 1980s, marking the commencement of the industry's growth. Proton and Perodua have manufactured a wide range of vehicles up to this point. Furthermore, the oil and gas industry play a significant role in driving the national GDP. Consequently, Malaysia faces significant difficulties in implementing environmentally friendly transportation options, such as electric vehicles (Kamarudin et al., 2022). Thus, owning and using private vehicles are still the options for many in Malaysia.

Another examples of country that are in effort to reduce carbon emission is Singapore. Singapore exemplifies effective management of difficulties (Kamarudin et al., 2022). They approach the difficulties with a serious attitude and seize the chance to enhance walkability among the population. The concept of achieving a "45-minute City", "20-minute Town", and "Walk-Cycle-Ride" in the Land Transport Masterplan 2040 is feasible for them due to the high efficiency of their transportation system. Furthermore, due to the restricted availability of space, it is advantageous for individuals to navigate on foot and transition between different modes of transportation. Malaysia and Indonesia could benefit from studying Singapore's approach to managing a densely populated city such as Kuala Lumpur and Jakarta. Facilitating efficient transportation infrastructure across the entire nation is a challenging endeavour. Thus, it is more advantageous to begin by concentrating on a localised region (Kamarudin et al., 2022) such as urban city centre in which has many tourist spots.

The local council plays an important role in making sure the low carbon city development can be practiced. In Malaysia, the Hang Tuah Jaya Municipal Council (HTJMC)

must devise a strategy to entice the people to choose public transportation as their primary mode of everyday transportation in Ayer Keroh, rather than relying on private vehicles. This step taken by the municipal council is aimed at supporting the state of Malacca in its mission to become a Green Technology State by 2020. The focus is on developing a sustainable transport system that prioritises both passenger satisfaction and environmental preservation (Kamaruddin, Osman, and Pei, 2012). This is because Melaka has many tourist attractions thus the implementation of such policies can affect the movement of the tourist whenever they are travelling around Melaka city.

### **Role of Transportation Infrastructure Influences on Overall Tourist Experience**

The research by Romão & Bi (2021) indicates that the employment of shared transport systems yields a more significant impact on trip satisfaction compared to recreational or retail environments. Consequently, it appears evident that well-developed shared transport infrastructures and services, bolstered by pertinent information disseminated through efficient channels, may facilitate the mobility of urban tourists while enhancing the overall satisfaction of their visit.

#### *Non-motorized Transportation Infrastructure*

In relation to the adverse consequences associated with motorized private transportation, metropolitan regions encounter difficulties, including traffic congestion, atmospheric pollution, and hearing disturbances from vehicular movement. To enhance circumstances for the population of urban localities, numerous municipalities implement counteractive strategies, such as the establishment of pedestrian-only zones or the introduction of congestion pricing mechanisms (Börjesson et al., 2015; Morton et al., 2017). This includes pioneering modes of mobility, such as shared mobility frameworks, information technology applications, and electric drive systems, along with the promotion of non-motorized transport methods like walking and cycling (Banister, 2008; Lanzendorf and Busch-Geertsema, 2014; Ogilvie et al., 2007; Piatkowski et al., 2019).

There are articles that mentioned on cycling activities as a part of the tourism. When evaluating the impact of tourism on sustainability, it is crucial to evaluate the specific mode of transportation used and its attributes (Buongiorno & Intini, 2021; Gossling & Peeters, 2015). Historically, motorized vehicles have been more prevalent than bicycles and public or collective transit in many EU countries (EEA (European Environmental Agency), 2018; Hjalager, 2015), in recent years, bicycles have been increasingly popular in the context of tourism due to their ability to offer eco-friendly, health-conscious, and authentic travel experiences (Han, Meng, & Kim, 2017; Lamont, 2009; Saayman & Saayman, 2012). According to a survey conducted by Isnart and Legambiente in 2020, the primary motivations for Italian cycling tourism, as reported by over 50% of domestic tourists and 63% of international visitors, are the scenic splendour of the landscapes and the abundance of cultural assets. Nevertheless, cycling tourists are also driven by various other factors, including their concern for environmental issues and their anticipation of bike-specific amenities that they hope to discover in Italian destinations.

Trishaw is part of the green transportation as it does not emit any harmful particles. Trishaw is one the active transport as it uses human energy to move. Trishaws have their

origins in the hand-drawn rickshaws that were first introduced to Asia in the early 1900s. (Edgerton, 2008).

According to (Samuel Yesuiah -, 2018), during the 1960s and early 1970s in Malaysia, the trishaw served as an alternative means of transportation alongside buses, taxis and cars. Undoubtedly, it was a prosperous commerce. They were also popular among tourists. during the 1960s and early 1970s in Malaysia, the trishaw served as an alternative means of transportation alongside buses, taxis and cars. Undoubtedly, it was a prosperous commerce. They were also popular among tourists. Nowadays, trishaw riders in Penang, Malaysia are currently seeing a decline in business, as their livelihoods heavily rely on foreign tourists (Tern Chern, 2023). With the zero carbon emissions efforts by the government, the trishaw business could become booming again and increasing the economic development of the country and individuals.

### *Electric Public Transport*

Electric vehicles in different modes are vital for the movement of tourist around their destination. For road transportation, electric buses and e-scooters are used for movement within the city. Hydrogen powered electric trains has been used in Germany for intercity services. Light Rail Transit (LRT) in Malaysia has been used widely by residents and tourist in the Klang Vallery area. According to Fikriah Ibrahim et al., (2024) in their research, the general population can benefit from increased accessibility with the expansion of the LRT route, enabling them to conveniently travel to employment, leisure activities, and healthcare facilities. The railway system provides passengers with the opportunity to travel at different times throughout the day, enhancing their mobility. Sustainable transport aims to promote more efficient and healthier ways of meeting the needs of individuals and society, while reducing the negative social and environmental impacts of current transportation practices. (Schiller, Bruun, and Kenworthy, 2010). Laws of Malaysia Act 715, Land Public Transport Act 2010 define the “land public transport” as the transport on land by means of land public passenger transport and land public freight transport, and includes land public transport services, terminals, facilities, networks, systems, operations and other services associated with such transport or land public transport services. (Percetakan Nasional Malaysia Berhad, 2011).

In some countries, the local council possesses the jurisdiction to provide incentives aimed at encouraging the adoption of efficient transportation alternatives, such as the implementation of bus lanes and transit priority measures. These measures can enhance the overall strategy of sustainable mobility management. (Schiller, Bruun, and Kenworthy, 2010). For example, the local government may choose to establish exclusive bus lanes to improve the effectiveness of public transportation and reduce traffic congestion. The bus lanes are specifically allocated for the exclusive use of buses or taxis and may be identified by paint, stripes, or signs. However, they are not physically segregated from other vehicles in the traffic stream (United Nations ESCAP, 2012). To ensure uninterrupted travel, public transit vehicles will exclusively use a designated lane, thereby avoiding any disruption from other cars. This would facilitate the efficient and timely operation of public transportation, namely buses, by eliminating any delays. Consequently, this will motivate individuals to choose land-based public transportation as their preferred mode of transportation, as it enables them to reach their destination at the required time (Sukri et al., 2017).



The presence of a robust public transportation system that spans the entire tourist area allows visitors to easily reach a greater variety of activities. (Miravet et al., 2021a). Consequently, the location becomes more competitive by providing a wider range of visiting options to the traveller, which also has a favourable impact on increasing the length of stay (Miravet et al., 2021b).

### **Future of Tourism and Transport**

The future of transportation includes the autonomous vehicle which in future could be as the attraction for tourism activities. Most of the present research on the potential utilization of Connected and Autonomous Vehicles (CAVs) in cities mostly concentrates on commuting and other forms of urban mobility that take place during daylight hours. (Kellerman, 2018). Transport as tourism is one of the attractions for some city centre. In this way, to have a sustainable green transportation can help in reducing the carbon emissions within the city.

Nevertheless, the anticipated transition to automation will influence all types of vehicle mobility utilized in urban tourism. This includes a diverse range of transportation choices, such as airport shuttles, transfers, city taxis, car rentals, and guided urban excursions utilizing vehicles. Connected and autonomous cars (CAVs) are anticipated to provide effective transportation choices during the last portion of a trip, facilitating smooth integration with various transportation modes. (Krueger et al., 2016). Consequently, they can exert a substantial influence on conveying urban tourists from locations such as a train station to their accommodations. (Cohen & Hopkins, 2019).

As Kellerman (2018) observes, the pace of autonomous vehicle (AV) adoption may differ not just among individuals, but also within countries. Moreover, it can be deduced that there would be notable discrepancies in the rate of acceptance within and among urban areas. Connected and autonomous cars (CAVs) will be introduced and impact certain cities before others. At first, the impacts will mainly be focused in the more advanced regions of the world, although cities globally will experience different effects, both in terms of their location and over time.

### **Conclusion**

In conclusion, transportations are interrelated with tourism as people use transportations from one place to another. The green transportations discussed are the few options that tourists can use during their holidays and vacations especially if the destinations are in the city centre in which usually these forms of green transportations are available.

Other than the physical infrastructures and vehicles, strategies and policies play important role in reducing the negative impact of transportations and tourism activities. From a policy perspective, this finding is significant as it provides valuable insight into the necessity of supporting sustainable transportation methods for both commuting and travel at the destination. Destination managers should recognize that tourists' decisions regarding transportation options may be influenced by changes in the allocation of public space among different modes of transport, enhancements in the accessibility of attractions and destinations through public transportation, and limitations on the use and parking of private vehicles. (Zamparini et al., 2022).

**Contribution of the Research**

While many studies have individually addressed sustainable transportation and tourism, there is a need of comprehensive analyses that investigate the complex connections between the two domains. This research endeavours to bridge this existing gap by investigating how sustainable transportation modes, such as non-motorized transport (NMT) and electric public transit systems, can significantly alter urban tourism landscapes, thereby presenting novel insights within both disciplines. This analysis furthers the expanding discussion on the vital importance of adopting environmentally responsible transportation policies within the tourism field. It elaborates on the concept that green tourism encompasses more than merely eco-friendly lodging or thorough travel practices; it also relates to the modalities through which tourists navigate urban environments, thereby extending the parameters of sustainable tourism.

**Suggestion for Future Research**

For future study, the probability of tourists opting for environmentally friendly modes of transportation, such as walking or public transport, increases as their length of stay increases can be assessed. This is because travellers with more days available for their visits are more likely to find these mobility options feasible. Therefore, extended durations of stay not only contribute to the sustainability of tourism to the place. (Gossling et al., 2018), however, they also play a role in enhancing the long-term viability and competitive advantage of the tourism destination. The beneficial impact of static holidays partially counteracts this effect by increasing the possibility of having environmentally friendly transportation options at the destination.

**Co-Author Contribution**

The authors confirmed that there is no conflict of interest in this article. Author 1 carried out the fieldwork and prepared the literature review. Author 2 and author 3 wrote the research methodology and did the statistical analysis and interpretation of the results.

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