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Article

Rethinking Gen-Z mobility: A comparative study of travel behavior across developed and developing nations

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Abstract: This paper critically reviews the prevailing generalizations in current research on Generation Z (Gen-Z) travel behavior. While various studies have characterized Gen-Z's transportation preferences as leaning towards sustainable and technology-integrated modes of transport, this paper argues that the findings are largely based on observations from developed countries and may not accurately reflect behavior in developing countries. This paper is written using a narrative literature study approach. Through a comprehensive literature review, the paper highlights the differences in Gen-Z travel patterns across different geographical regions, emphasizing the need for context-specific analysis. The paper addresses often overlooked factors such as economic limitations, infrastructure challenges, and cultural nuances that shape mobility choices. The aim is to dissect the cohort effect and look at its validity across different socio-economic landscapes through existing literature. As such, the paper provides nuanced insights into the heterogeneity of Gen-Z travel behavior and suggests cautioning against over-generalization, as well as advocating for a more localized approach in transportation policy and planning. The paper also encourages similar research in developing countries to gain a more comprehensive understanding of Gen-Z travel behavior globally.

Keywords: travel behaviour; human mobility; cohort effect; Generation Z

1. Introduction

Amidst rising global awareness on environmental sustainability, the travel behavior of the younger generation, particularly Generation Z, has garnered intensive research focus across the world. Previous studies, especially in developed countries, have suggested that Gen-Z tends to prefer public transport, cycling, and walking as part of their commitment to environmentally friendly practices (Nowacki et al., 2023; Prayag et al., 2022; Ribeiro et al., 2023). They are also said to be less interested in using private vehicles compared to previous generations (Weber, 2024). These findings reflect a significant shift in values that could have a profound impact on urban planning and transportation policies in the future. However, these findings do not seem to be universal, particularly in developing countries where the transportation infrastructure is often inadequate, and public transport is minimal (Çelik et al., 2023; Jayaraman, 2011). In these cities, Gen-Z may have no choice but to rely on private vehicles, or they face different challenges that are not considered by the existing

literature. Therefore, it is crucial to understand whether the behavioral patterns reported in developed countries also emerge in developing nations, and if not, what are the reasons behind the differences.

Existing research often generalizes the behavior of Gen-Z without considering the contextual differences between developed and developing countries (Csobanka, 2016; Jamal and Newbold, 2020; Moise et al., 2020; Shin and Tilahun, 2022). This gap creates a distortion in our understanding of the travel behavior of the younger generation globally. In the book, "The Generation Myth," Professor Bobby Duffy goes to the extreme of arguing that many ideas about generational differences are actually based on stereotypes or misconceptions, and that there are more similarities between generations than is often believed (Duffy, 2021). Many studies overlook factors such as lack of infrastructure, security, reliability of public transport services, and economic factors (Purohit et al., 2022; Yunitasari and Parahiyanti, 2022) which significantly influence transportation choices in developing countries. Generalizing this behavior creates a distortion in our understanding of the global travel behavior of the younger generation and leads to policy recommendations that are ineffective or inappropriate. For example, policies designed based on observations of Gen-Z's behavior in developed countries might not be successfully implemented in developing countries without adjustments that consider local factors. This shows the need for a more differential and contextual approach in travel behavior research, where data from different geographical and economic contexts are analyzed separately to appreciate local nuances. Failure to do so not only limits the effectiveness of transportation interventions but may also inadvertently exclude or ignore the needs and realities of transport users in developing countries.

This paper is crafted employing a narrative literature review approach. This methodology encompasses the extensive collection, examination, and analysis of existing literature without the acquisition of new primary data. Through the literature review, this paper endeavors to identify where there are gaps in data or divergences in findings, particularly within the context of developing countries which may be underrepresented in current research.

This paper is a critical review of previous studies that overgeneralize study findings related to the characteristics and travel behaviour of Gen-Z. This paper is essential to provide a more balanced and realistic perspective on the travel behavior of Generation Z in developing countries. It enables policymakers, urban planners, and transport practitioners to gain a deeper understanding of the specific needs and challenges faced by the younger generation in the context of their daily travel. Consequently, more effective and inclusive strategies can be devised to promote the use of more sustainable transportation options that accommodate not only the values of Gen-Z but also their local realities. Through this paper, it is anticipated that the factors impeding or supporting sustainable transport behavior among Gen-Z in developing nations will be identified and analyzed, and recommendations will be provided that could assist in integrating the needs and preferences of the younger generation into urban transport planning and policy.

2. Method

This paper is designed as a critical review of existing literature, rather than a field study collecting primary data. The main purpose of this paper is to examine and critique generalizations that often appear in existing Gen-Z travel behavior studies, many of which are conducted in developed countries. In many cases, the phenomena described do not necessarily reflect the reality in developing countries, where different socioeconomic and infrastructural conditions can significantly affect travel behavior. From the outset, this paper is intended to be a literature review that highlights the need for more contextualization in travel behavior research, especially when applying findings from one geographic or economic context to another. Therefore, it is not intended to be an empirical study with primary data collection or specific case studies.

This paper will be conducted employing a narrative literature review approach. A narrative literature review is a methodical approach to synthesizing information from a wide range of literature sources to compose a coherent narrative about a specific topic. Unlike systematic literature reviews, which follow a more structured and quantitative analysis, narrative reviews focus on depicting and synthesizing available literature to draw conclusions based on existing evidence (Green et al., 2006). This approach involves a critical evaluation of included studies and provides a comprehensive narrative synthesis of the available information (Dunham et al., 2013). Narrative literature reviews are not as rigid as systematic reviews, but rather they explore narrative evidence surrounding a topic (McPherson et al., 2019). They serve a critical scientific function by providing detailed and thorough examinations of the published literature, contributing to the foundation of academic inquiry (Xiao and Watson, 2019). The narrative review methodology aligns with rigorous literature examination, emphasizing the importance of comprehensive and critical evaluation of existing research (Dunham et al., 2013).

The narrative literature review is a crucial approach in academic research, offering a comprehensive and critical analysis of existing knowledge on specific topics. This review involves synthesizing and summarizing literature to identify gaps and inform future research directions (Bombak and Hanson, 2016; Motealleh et al., 2019). It plays a key role in consolidating insights, identifying recurring themes, and constructing a comprehensive meta-narrative that informs policies, practices, and further studies (Larsson and Broström, 2020; Mengistu and Manolova, 2019). Unlike systematic reviews, which use formal quality assessment tools, narrative reviews focus on narrative synthesis, critical analysis, and summarization of theories and concepts without standard quality evaluation tools (Cummins et al., 2024; Hettithanthri and Hansen, 2022).

Narrative literature reviews are employed across various disciplines such as medicine, business, education, and social sciences (Fraser et al., 2018; Healey and Healey, 2023; Juntunen and Lehenkari, 2021). This method serves as a review approach in itself, enhancing the understanding of complex subjects by combining methodologies from systematic reviews to reduce article selection bias and employ effective bibliographic research strategies (Healey and Healey, 2023).

In conclusion, the narrative literature review is an essential tool in academia for synthesizing existing knowledge, identifying research gaps, and guiding future

research directions across various disciplines. Although it lacks standardized quality assessment tools, narrative reviews offer credible and comprehensive analysis of subject domains, enabling critical analysis and summarization of theories and concepts. In narrative literature reviews, authors gather and present findings from a range of literature sources such as books, journals, articles, and reports, without engaging in rigorous selection processes or formal quality assessments. The goal is to provide a comprehensive understanding of the discussed topics, identify trends, knowledge gaps, and unresolved questions, and offer insights and perspectives that can inspire further research. This method is frequently used in research papers, article reviews, book chapters, and other academic writings.

It is important to clarify that, in this paper, the terms "developed" and "developing" countries are used to denote significant differences in the availability and quality of transportation infrastructure and public transit services. Developed countries tend to have access to higher quality transportation infrastructure and more efficient and convenient public transit systems. In contrast, many developing countries still struggle to achieve similar standards, despite visible progress. This imbalance not only reflects economic disparities but also shows how such infrastructure and services influence transportation choices and travel behavior, particularly among Generation Z. This discussion is important for understanding the broader context in which Generation Z's travel behavior is shaped, providing insights into how transport policy and urban planning can be geared to support the mobility needs of future generations.

3. Literature review

3.1. Generation Z's travel behavior

Generation Z, born between the mid-1990s and the early 2010s, is distinguished by unique characteristics that set them apart from previous generations. According to William Strauss and Neil Howe who are generational researchers, Generation Z is summarized as the 15th documented generation in the history of the United States (Seemiller and Grace, 2018). As the first digital natives, they have grown up in a digital era filled with rapid internet access, smartphones, and social media (Çoklar and Tatli, 2021; Serda, 2022; Thangavel et al., 2022). This has made them adept at using technology and often more comfortable communicating through digital platforms than face-to-face interactions. Furthermore, they possess a strong global awareness, having been raised in a more multicultural environment and exposed to global issues from a young age, which influences their views and priorities on matters such as environmental sustainability and social equality (Csobanka, 2016; Seemiller and Grace, 2018; Tim, 2014). Unlike previous generations such as Baby Boomers or Gen X, who tend to have more conservative and traditional views, Generation Z tends to be more liberal in their social and political views and more open-minded (Akkuş and Richardson, 2023; Gazzola et al., 2020; Harmon et al., 2022). Moreover, Gen Z exhibits a strong preference for authenticity and transparency in both marketing and politics (Liu et al., 2023; Su et al., 2019). They are inclined to avoid brands and institutions perceived as inauthentic or non-transparent in their operations. This approach reflects a shift in values and behaviors that continue to influence social and economic dynamics as they increasingly enter the job market and become dominant

consumers.

The travel behavior of Generation Z, reflects a strong inclination toward more sustainable and technologically integrated transportation. A heightened environmental awareness encourages them to prefer using public transport, cycling, or walking over relying on private vehicles (Kamargianni and Polydoropoulou, 2013; Kaplan et al., 2016; Mansoor et al., 2022). This aligns with their increasing concerns about issues such as climate change and carbon footprint reduction. In many major cities in developed countries, facilities like safe bicycle lanes and efficient public transportation systems have been strong supporting factors enabling them to adopt this sustainable lifestyle easily. Additionally, the integration of technology into daily life plays a significant role in determining their transportation choices (Pricope Vancia et al., 2023; Windasari et al., 2022). Mobile applications that provide real-time information on public transportation schedules, bicycle availability, and pedestrian routes make it easier for them to plan their daily journeys. Generation Z also tends to value flexibility and convenience, making the existence of technology that supports efficient transportation systems highly compatible with their desire for greater control over their time and mode of travel.

Generation Z, having grown up in the information age, has developed a heightened awareness of environmental issues, which are being highlighted more than ever. They have witnessed an increase in public reports and discourse on climate change, pollution and sustainability, which directly affects their environmental perspectives. The ease of access to various social media platforms and the internet has enriched them with various sources of detailed information regarding human impact on the earth and various global initiatives to combat such negative impacts. Over time, this has spurred a more proactive response from Gen Z to environmental issues compared to prior generations who may not have absorbed and reacted to this information as swiftly or deeply. Furthermore, Gen Z faces the reality that they will live longer with the consequences of worsening climate change if no actions are taken. This endows them with a robust motivation for more sustainable behavior, including in their transport choices, consumption, and other habits (Nowacki et al., 2023; Prayag et al., 2022; Ribeiro et al., 2023). Movements like “Fridays for Future,” spearheaded by youth figures like Greta Thunberg, demonstrate Gen Z’s substantial commitment to advocating for environmental policy change and supporting eco-friendly initiatives. This awareness is bolstered by their desire to secure a better future, not just for themselves but for future generations as well.

The heightened environmental consciousness among Generation Z is a phenomenon observed globally (Ameen et al., 2023; Su et al., 2019; Yarnykh, 2023), though its expression can vary significantly depending on regional, economic, and cultural contexts. This generation, more connected through digital technologies than any before, has unprecedented access to information, fostering a global awareness of issues such as climate change and sustainability. Studies and surveys from various countries show that Gen Z individuals generally care more about environmental issues than older generations (Silveira et al., 2022; Zhitomirsky-Geffet and Blau, 2016), and they are more likely to believe climate change is primarily caused by human activity. However, while this trend is noticeable globally, the degree to which Gen Z can act on these environmental concerns can differ greatly. In wealthier, developed countries,

Gen Z may have more access to sustainable options like recycling programs, renewable energy, and eco-friendly products. In contrast, in developing regions, while awareness might be high, practical options for living sustainably may be limited by economic and infrastructural constraints. This means that while the environmental values of Gen Z are a global phenomenon, the ways in which these values are manifested and acted upon can be quite diverse.

3.2. What about Gen-Z in developing countries?

Despite coming from diverse backgrounds, this generation generally shows a global trend towards greater environmental awareness than previous generations (Song et al., 2020). Including in developing countries, Gen Z shows high concern for the environmental impact of their travels, which is reflected in their interest in sustainability policies and green innovations. This awareness often leads them to seek greener alternatives where possible, such as the use of public transportation or non-motorized vehicles. In addition, the use of technology in planning and traveling is another common characteristic among Gen Z (Silveira et al., 2022), both in developed and developing countries. They tend to utilize travel apps to check public transportation schedules, book ride-sharing services, or navigate the best routes, demonstrating proficiency in integrating digital solutions into daily life. The use of these technologies helps them make more efficient and often more economical travel choices, reflecting their adaptation to an increasingly digitized world that is not limited by geographical or economic boundaries.

However, in several aspects, Gen Z's travel behavior in developing countries shows stark differences compared to their counterparts in developed nations, primarily due to infrastructural limitations and economic factors. Despite high environmental consciousness, Gen Z in developing countries often has to opt for more affordable and practical modes of transportation even if they are less eco-friendly (Kumagai and Managi, 2020; Ogryzek et al., 2020). Underdeveloped public transportation infrastructure, such as a lack of efficient bus networks or reliable train systems, often restricts their choices. This condition prompts the young generation to rely more on private transportation such as motorcycles or personal cars (Fisu et al., 2024), which may be more flexible but less energy-efficient. On the other hand, technology has played an important role in shaping their travel behavior. Gen Z in developing countries, as well as in developed countries, tend to use smartphone-based apps for navigation and ride-sharing services, which offer a more accessible and sometimes more economical alternative to traditional public transportation. However, issues such as reliability and safety in using public transportation are still major concerns that often prevent them from fully adopting green options. In this context, efforts to improve transport infrastructure and reliability can help drive the adoption of more sustainable travel behavior among Gen Z in developing countries.

4. Discussion

4.1. Interpretation of study findings

In developed countries, Generation Z's perception of private vehicle ownership

has significantly shifted. Young people no longer regard private vehicles as essential status symbols or lifestyle elements, diverging from previous generations' assumptions (Brown et al., 2016). This shift arises from changing values and priorities, with environmental awareness, efficiency, and practicality being paramount. Studies have shown that a majority of carsharing users in the UK and Germany, who are from Gen-Z, report reducing their personal car usage (Kolleck, 2021; Le Vine and Polak, 2019). This generation prioritizes sustainability and tends to choose public transport, walking, and cycling, perceived as more environmentally friendly and healthier options (Grzesiuk et al., 2023; Olsson et al., 2020; Parzonko et al., 2021; Sim et al., 2022). The provision of supportive infrastructure, such as safe bike lanes and efficient public transport systems, also facilitates this shift, making it easier for them to adopt a more sustainable lifestyle. Conversely, in some developing countries, private vehicles continue to be seen as significant social status symbols, often showcased in advertisements featuring Gen-Z as stars. This is primarily due to inadequate public transport infrastructure and a lack of safe, comfortable transportation alternatives. In many major cities in developing countries, traffic congestion and the absence of good public transport facilities make private vehicles a more reliable and convenient choice. Additionally, economic growth and increased middle-class income often correlate with car ownership as part of lifestyle aspirations. As a result, private vehicles remain a popular choice among the populace, including Gen Z, in these countries.

Young people in developed nations face challenges in accessing private vehicles due to stringent regulations (Singh et al., 2023; Trung Bui et al., 2020), revealing that regional regulations also influence Gen-Z's travel behavior. In developed countries, strict regulations often pose barriers for the youth in accessing private vehicles, limiting their ability to own and operate cars independently. In contrast, in some developing nations, lax enforcement of regulations allows many young individuals to easily use their parents' private vehicles. This often leads to risky driving behaviors, where adolescents drive vehicles without adequate supervision or experience, increasing the potential for accidents and traffic violations (Gershon et al., 2017; Simons-Morton et al., 2012). This phenomenon reflects significant differences in policy and practices in vehicle access management between developed and developing nations, as well as its impact on safety and driving behavior among the youth, including motorcycling. In developing countries such as Indonesia, India, and Sri Lanka, riding motorcycles is a popular means of mobility for the community and often the most accessible mode of transportation for many (Amarasingha, 2021; Cheng et al., 2015).

The differences in travel behavior of Generation Z in developing countries can be understood through several key factors that influence their decisions and behaviors. One primary factor is urban planning, which often fails to provide efficient and safe transportation infrastructure. In many cities within developing nations, the lack of safe pedestrian pathways, bike lanes, and reliable public transport limits the options for sustainable transportation. This situation frequently forces Gen Z to rely on personal transportation, which may be more costly and less environmentally friendly, or on other alternatives like motorcycle taxis that are more flexible but also risky. Economic constraints also play a significant role in shaping Gen Z's travel behavior in developing countries. With generally lower incomes compared to developed nations,

cost becomes a major consideration for Gen Z when choosing a mode of transportation. This often leads to less sustainable choices, as more affordable public transport options may not be available or practical for daily use. For instance, the cost of owning a private vehicle may be seen as a more economical long-term investment compared to the ongoing costs of inefficient public transport.

Safety factors and technology availability also significantly impact their decisions. In developing countries, safety concerns regarding the use of public transportation often deter Gen Z from utilizing these services, especially during certain hours or on routes considered unsafe. While Gen Z in developing countries is very familiar with technology, the availability and integration of technology in transportation systems may still be limited. This reduces their ability to fully utilize apps and digital services that could facilitate and enhance their travel experiences. These limitations often affect the effectiveness and comfort of their daily commutes, adding to the challenges already presented by other factors.

Despite these differences in travel behavior, many research findings show consistent patterns between developed and developing countries. Known for being highly active and frequently traveling, Gen Z exhibits a strong inclination for tourism (Çalişkan, 2021; Ozdemir-Guzel and Bas, 2021; Seyfi et al., 2023), both in developed and developing nations. Easy access to information through digital technology allows them to quickly discover and explore new places (Akgiş İlhan et al., 2023; Dewi et al., 2021; Stanković et al., 2018). With the widespread use of smartphones and social media, Gen Z has a unique capability to unearth information about new destinations or the latest travel trends, enabling them to plan and enjoy trips more independently and efficiently. This phenomenon not only transforms the dynamics of the tourism industry but also promotes the development of transportation infrastructure and services that are more adaptable to the needs of this dynamic young generation.

The use of ride-sharing, ride-hailing, and online transportation applications now dominates the urban transportation landscape, with Generation Z across both developed and developing countries being the primary users of these services. In developed countries, applications like Uber and Lyft offer convenience and flexibility that align with the dynamic and technology-oriented lifestyles typically associated with Gen Z (Akram et al., 2024; Asgari et al., 2022). They value the ability to access transportation quickly and efficiently, often preferring these app-based services as an alternative to owning a private vehicle for economic and environmental reasons. In developing countries, despite challenges such as underdeveloped infrastructure and security issues, the popularity of ride-hailing and ride-sharing is also on the rise among Gen Z. Here, such services often become the choice due to practicality and as a solution to the lack of efficient public transportation services. Gen Z in developing countries is also keen on using the latest technology, including transportation apps, to enhance their quality of life and mobility.

Figure 1 showcases survey results from 794 cities across more than 61 countries, revealing the tendencies of each country in the usage of public transport, private vehicles, or engaging in active transport (Prieto-Curiel and Ospina, 2024). Numerous factors influence these trends, including each country's policies, whether they support public transport or facilitate private vehicle use. Social and cultural conditions also significantly affect Gen Z's travel behavior across different countries (Asthu and Putra,

2021; Tian et al., 2021; Zannat et al., 2021). In a social context, societal norms and prevailing cultural values can determine how open or resistant a community is to using public transportation or other alternative forms of transport (Schwartz, 2014). For example, in some Asian countries like Japan and South Korea, the use of public transport is very high due to strong cultural values of efficiency and collectivism. However, in some developing countries in Southeast Asia, the use of private motorcycles is more dominant due to the ease and speed they offer in dealing with traffic congestion. Furthermore, government policies play a crucial role in shaping travel behavior. In Europe, many cities such as Amsterdam and Copenhagen have long implemented policies that support the use of bicycles and public transport by providing safe and convenient infrastructure. These policies have successfully attracted many young people to choose cycling or walking as their primary mode of transport. Conversely, in several major cities in developing countries, the lack of policies supporting pedestrians and cyclists often complicates the use of these modes of transport, especially without safe and segregated lanes from motorized traffic. These differences create variations in the adoption and adaptation of sustainable travel behaviors among Gen Z. Governments that are proactive in creating policies that support sustainable transport tend to see a faster and broader adoption of such behaviors among their citizens. For instance, subsidized fare policies in some European cities facilitate younger generations' access to public transport at more affordable costs, increasing its usage (Asensio et al., 2013; Jones et al., 2012; Štraub, 2020). Without this policy support, young people in developing countries may have to rely on cheaper but less environmentally friendly options, such as private vehicles or motorcycle taxis, which cater more to short-term needs rather than long-term sustainability.

Figure 1. The most frequently used mode of transportation in different countries (Prieto-Curiel and Ospina, 2024).

In developed countries, Gen Z's perception of private vehicle ownership has shifted significantly. Private vehicles are no longer seen as essential status symbols or lifestyle necessities as believed by previous generations. This change is due to shifts in values where environmental consciousness, efficiency, and practicality are now main considerations. This generation prioritizes sustainability and tends to choose public transport, walking, and cycling, considered more environmentally friendly and healthier options. The provision of supporting infrastructure, such as safe bicycle lanes

and efficient public transport systems, also facilitates this shift, making it easier for them to adopt a more sustainable lifestyle. Conversely, in some developing countries, private vehicles are still often viewed as important social status symbols. Even many sales advertisements feature Gen Z as their stars. This is mainly due to inadequate public transport infrastructure and a lack of safe and comfortable transport alternatives. In many major cities in developing countries, traffic congestion and the lack of good public transport facilities make private vehicles a more reliable and comfortable choice. Moreover, economic growth and rising incomes among the middle class often link car ownership with lifestyle aspirations. As a result, private vehicles remain a popular choice among the population, including Gen Z, in these countries.

4.2. Critique of existing literature

Criticisms of the existing literature on Gen-Z travel behavior can be directed at several key aspects: bias, methodological limitations, and geographic focus. First, many studies tend to assume that Gen-Z's preference for sustainable transportation modes such as walking, cycling, or using public transportation is a global phenomenon. However, such generalizations often ignore the different socio-economic and infrastructural contexts between developed and developing countries. This can introduce bias, as assumptions based on data from developed countries may not be relevant or accurate when applied to the context of developing nations. Secondly, methodological limitations in research often affect the validity of generalizations. Many studies use samples that are not representative or are limited to specific groups within Gen-Z, such as students in urban settings, which do not reflect the entire population of Gen-Z, especially in rural areas or developing countries. Moreover, the use of self-reporting survey methodologies can lead to response bias as participants may provide answers they believe are desired by researchers or that align with prevailing social norms. Furthermore, a narrow geographic focus in much of the literature tends to concentrate findings on specific regions, typically Western countries or major cities with infrastructure and policies supportive of sustainable transportation. This neglects the significant variations in travel behaviors and conditions in other locations, particularly in developing countries where challenges like traffic congestion, lack of safe infrastructure, and inefficient public transportation affect Gen-Z's transportation choices. This critique is crucial to ensure that findings and recommendations from travel behavior studies are more inclusive and relevant across various geographic and social conditions.

Table 1 illustrates findings from several studies related to Gen-Z's travel behavior and preferences, but it includes several notes, especially when considered in the context of developing countries.

Table 1. Critique of previous research findings related to Gen-Z travel behavior.

Characteristics of Gen Z	Source	Critique & case study
Difficult to access private vehicles	(Brown et al., 2016; Grzesiuk et al., 2023; Parzonko et al., 2021; Sim et al., 2022)	In developed countries, young people often face difficulties accessing private vehicles due to factors such as stringent environmental policies, high costs of vehicle ownership, and trends promoting the use of public transport and more environmentally friendly modes of transport like cycling and walking (Grzesiuk et al., 2023; Parzonko et al., 2021). This aligns with efforts to reduce carbon emissions and enhance urban life quality through decreased congestion and pollution. Conversely, in developing countries such as India, Vietnam, and Indonesia, the situation faced by Gen Z is markedly different. In these countries, private vehicles, especially motorcycles, are often more accessible to the youth.This accessibility results from a combination of factors including inadequate public transportation infrastructure, the need for more flexible mobility options, and cultural norms that regard personal vehicle use as a status symbol or for practical reasons. In major cities of these countries, motorcycles are considered a practical solution for overcoming traffic congestion and reducing travel time, often being more affordable than cars, thus making them a popular choice among the young population (Rivanka et al., 2022; Rusman et al., 2022; Sadeghi-Bazargani et al., 2015; Trung Bui et al., 2020; Truong et al., 2020; Velagapudi & Ray, 2017; Wadud, 2020; Weiss et al., 2010).
Have a strong preference for public transport, walking and cycling	(Buehler and Nobis, 2010; Davis et al., 2012; Grimsrud and El-Geneidy, 2014)	In developed countries such as Germany and Sweden, Generation Z tends to have a strong preference for public transport, walking, and cycling, largely driven by high environmental awareness and supportive infrastructure. These choices often form part of a lifestyle that is more sustainable and health-oriented (Kartschmit et al., 2020; Kleszczewska et al., 2020; Weber, 2024). Conversely, the situation in developing countries often differs. In nations such as Brazil, India, and Indonesia, although there is a segment of Gen-Z that is also interested in sustainable practices, numerous challenges make public transport, walking, and cycling less attractive or even impractical. Inadequate infrastructure, such as insufficient or poorly maintained pedestrian paths and bicycle lanes, along with potentially inefficient or unsafe public transport services, are some of the main barriers (Ardhaneswari and Agustapraja, 2023; Chopdar et al., 2023; Devin et al., 2021; Lima et al., 2017; Mahmudah et al., 2018; Oliveira et al., 2020; Stankov et al., 2020; STREB et al., 2019; Tallar et al., 2023).
Having the view that a private car is no longer a symbol of social status and lifestyle, and even tend to delay having a driver's license	(Brown et al., 2016; Olsson et al., 2020; Parzonko et al., 2021)	In countries like France, Generation Z often no longer views private cars as symbols of social status or an essential lifestyle component. They tend to value public transportation, walking, and cycling more, reflecting their increased environmental awareness and a shift towards more sustainable and urban lifestyles (Bayart et al., 2020). Conversely, in developing countries such as the Philippines, Thailand, and Vietnam, the perspective can be quite different. Many young people there still regard private vehicles, particularly cars and motorcycles, as symbols of achievement or status. In these contexts, private vehicles are still highly coveted (Nguyen et al., 2023; Rose-Clarke et al., 2022), and this is often reflected in how vehicles are marketed. Advertisements frequently feature young people, depicting the vehicle as an integral part of a desirable lifestyle and reflecting distinct social and economic values where vehicle ownership is still seen as a symbol of personal success and social mobility.
Have a view that the use of active modes such as walking and cycling has a positive impact on life satisfaction and mental health.	(Bulin et al., 2024; Chan and Li, 2022; Clark et al., 2020; Kurata et al., 2023; Olsson et al., 2020)	In developing countries such as India and Indonesia, the perception of young people, including Generation Z, towards active modes of transportation such as walking and cycling often differs from that in developed countries like the Netherlands or Denmark. Factors such as inadequate infrastructure, the absence of safe pedestrian and cycling paths, and high levels of pollution can diminish the appeal of walking or cycling as daily transportation options in major cities like Jakarta or Mumbai (Rivanka et al., 2022; Rusman et al., 2022; Trung Bui et al., 2020; Truong et al., 2020; Wadud, 2020). Despite these challenges, in some cities like Bogotá, Colombia, there is a growing awareness of the health benefits and life satisfaction that can be gained from walking and cycling (Carlson et al., 2015; Lemoine et al., 2016; Salvo et al., 2017). Efforts to improve infrastructure and create a safer and more comfortable environment for active transportation are being made as part of a broader strategy to enhance the quality of life. However, obstacles such as safety concerns, the lack of supporting facilities, and social norms that may not favor the use of active modes often still pose significant barriers.

Table 1. (*Continued*).

Characteristics of Gen Z	Source	Critique & case study
This is the group that travels the most, has an active lifestyle and relies on public transportation.	(Çalişkan, 2021; Olsson et al., 2020; Ozdemir-Guzel and Bas, 2021; Seyfi et al., 2023)	In developed countries like Germany and Japan, Generation Z is known as the group that travels the most frequently, leading active lifestyles and heavily relying on public transportation (Taima and Asami, 2020; Takahashi, 2021; Totsune et al., 2021; Więckowski and Timothy, 2021). The well-integrated public transportation systems in these countries support sustainable and efficient travel behaviors. Conversely, in major cities of developing countries such as India, Brazil, and Indonesia, although the youth, including Gen Z, tend to travel often and maintain active lifestyles, they frequently do not rely on public transportation. The accessibility and quality of public transport in these countries do not deter them from staying mobile. Many of them turn to alternatives like motorcycles or ride-hailing services, which are more flexible and can cover more areas compared to often inadequate public transportation. This illustrates significant differences in transportation choices driven by disparities in transportation infrastructure conditions between developed and developing countries (da Rocha Alves et al., 2020; Rivanka et al., 2022; Rusman et al., 2022).
More likely to use multimodal transit services, on-demand/ridesourcing, ridehailing, carsharing, and active travel modes than previous generations	(Acheampong et al., 2020; Asgari et al., 2022; Azimi and Jin, 2022; Deka and Fei, 2019; Rayle et al., 2016; Sikder, 2019)	In developed countries like Germany, Russia, and France, Generation Z tends to favor multimodal transport services such as ride-sourcing, ride-hailing, car-sharing, and active transportation modes more than previous generations. This trend aligns with an increased environmental awareness and a preference for efficiency and convenience in transportation, facilitated by digital technology and mobile applications that ease access to these services (Bekka et al., 2020; Burghard and Scherrer, 2022; Olayode et al., 2023; Tarnovetckaia and Mostofi, 2022). A similar trend is also evident in developing countries. In nations like Brazil, India, and Indonesia, the younger generation adopts services such as ride-sourcing and ride-hailing, viewed as more convenient and flexible alternatives to often disorganized and unreliable public transportation systems (Belgiawan et al., 2022; Burhan et al., 2021; Chalermpong et al., 2023; Goel and Haldar, 2020; Kumar et al., 2022; Siqueira et al., 2023). Car-sharing and active modes like cycling or walking are also gaining popularity, particularly in major cities where infrastructure improvements and increased environmental sustainability awareness are occurring.
Doing multitasking activities (online) while on public transportation, or on the go, such as studying, reading news, listening to music, social media and playing games.	(Dharmowijoyo et al., 2021; Keseru et al., 2020; Keseru and Macharis, 2018; Rizki et al., 2021; Shaw et al., 2019)	In developed countries such as the UK and France, Generation Z often engages in multitasking activities while using public transportation, such as studying, reading news, listening to music, social media interaction, and playing games (Chan and Lee, 2023; Ozdemir-Guzel and Bas, 2021; Wawer et al., 2022). This is facilitated by the high quality of public transportation and often longer travel times, providing them the opportunity to use their travel time effectively. This trend is also observed in developing countries like Indonesia (Dharmowijoyo et al., 2021; Dwi Atmaja and Alvin, 2023; Rizki et al., 2021). However, despite high reliance on technology, the inadequate quality and access to public transportation often hinder effective multitasking during travel. Journeys are typically shorter and less comfortable, which does not support activities such as reading or studying comfortably. Additionally, the density and physical conditions of public transport can be barriers to focusing on productive activities, unlike the conditions often found in developed countries.

Another critique is directed at the use of the cohort effect in studies of Gen-Z's travel behavior, which often exhibits a tendency to distinctly segregate behaviors between cohorts, as if these differences are solely influenced by generational disparities. Such an approach tends to overlook broader contextual factors, such as concurrent changes in technology, economics, and social conditions that affect all cohorts. For instance, increased environmental awareness and advancements in transportation technology impact travel choices across all ages, not just Gen-Z. Researchers like Norman (Ryder, 1985) have highlighted this complexity, suggesting that behaviors perceived as characteristic of one cohort may in fact be more heavily influenced by age factors or broader environmental changes. Reliance on the cohort effect can oversimplify the actual complexities of changing social dynamics and behaviors, leading to misleading conclusions about the real causes of travel behavior changes. This could result in misguided policies due to not considering the diversity within the cohort itself (Pilcher, 1994). Moreover, an overemphasis on the cohort effect in the literature could obstruct a deeper understanding of the interactions between individual and structural factors. Often, changes in transportation policy, infrastructure development, and social norms have a more significant impact on travel choices than cohort factors alone. For example, the development of an efficient transit system might influence Gen-Z's use of public transport more than their generational values or attitudes. Therefore, it is crucial to integrate cohort effect analysis with a broader understanding of external factors influencing travel choices, to avoid bias in data interpretation and policy recommendations (Yang and Land, 2016).

In several studies related to Gen-Z's travel behavior, a frequent issue arises in delineating and differentiating the influences of the cohort effect, period effect, and life-course and age effect. This failure results in significant overlaps between these temporal effects, each potentially impacting travel behavior differently. The cohort effect refers to influences uniquely experienced by a cohort during significant events in their youth; the period effect relates to events occurring at a specific time affecting all cohorts; while life-course and age effects capture behavioral changes that occur as individuals age. Without clear separation of these effects, it becomes challenging to determine which factor most significantly influences travel choices in a particular generation. For instance, the increased use of public transport by Gen-Z could be interpreted as stemming from unique generational values (cohort effect), but it could also be influenced by a global increase in sustainable transport policies during a specific period (period effect), or even changes in life stages affecting travel needs (life-course effect). This confusion often obscures deeper understanding of how best to design effective policies or interventions. To produce more accurate analyses and appropriate policy recommendations, it is crucial for researchers to employ more sophisticated and detailed methodologies in differentiating these effects and interpreting data accurately.

The critique of generalizations in the literature on Gen-Z travel behavior highlights the urgent need for more nuanced and contextual approaches in transportation behavior research. Researchers must integrate broader geographic, socioeconomic, and cultural variations in their analyses to produce findings that are relevant and applicable across various contexts. Emphasizing the separation between the cohort effect, period effect, and life-course & age effects is also vital for

understanding the actual dynamics shaping transportation choices. By acknowledging and addressing these shortcomings in existing studies, the academic community can move towards more informed policy-making and the design of more inclusive and sustainable transportation systems. Furthermore, employing methodologies sensitive to local factors will strengthen the validity of travel behavior studies and enable more precise decision-making. This will not only enrich the academic literature but also enhance the implementation of policies that can respond to the real needs of the community. Thus, approaching this topic with a critical and open perspective will aid in understanding the complexities of Gen-Z's travel behavior and provide more effective recommendations for the future of sustainable transportation.

4.3. Theoretical implications

The findings on the differences that challenge existing theories or models of generational travel behavior reveal a need for a revision in understanding how different generations adopt and adapt to modes of transportation. Previous generational theories often assumed that each generation has distinct behavioral characteristics that remain stable over time. However, recent observations, particularly of Gen-Z in developing countries, suggest that external factors such as economics, technology, and infrastructure play a more significant role than previously anticipated. This indicates that travel behavior is not only rooted in generational values or preferences but is also heavily influenced by environmental conditions and available opportunities.

Furthermore, these findings challenge the assumption that generational preferences for sustainable transportation automatically translate into similar choices worldwide. For instance, while Gen-Z in developed countries may opt for public and non-motorized transport due to environmental reasons, their counterparts in developing countries may be hindered by a lack of viable options and inadequate infrastructure. This underscores the importance of local context in determining how and why a particular generation acts as they do concerning transportation, challenging more universal or homogeneous models that have been widely accepted. Finally, revisions to the models of generational travel behavior need to account for dynamics that are more fluid and often contextual. The significant differences in travel behavior among Gen-Z across various countries highlight the importance of situational factors in shaping transportation choices. This encourages researchers and policymakers to more thoroughly analyze and integrate variables such as local policies, economic changes, and technological advancements in understanding and predicting future transportation trends. An approach that is more adaptive and responsive to specific contexts can aid in designing more effective and inclusive policies that meet the needs of various generations.

5. Conclusion

This paper highlights the importance of considering geographical context and local conditions in understanding Gen-Z travel behavior globally. Existing research often generalizes Gen-Z behavior in developed countries as a global reflection, which is inadequate given the significant differences between developing and developed

countries, especially in terms of transportation infrastructure and accessibility. In developed countries, Gen-Z shows a strong preference for public transit and active modes of transportation as part of a sustainable lifestyle and high environmental awareness. In contrast, in developing countries, despite the desire to participate in sustainable transportation practices, infrastructure and safety limitations often prevent the full implementation of these options. Young people in these countries may rely more heavily on private vehicles, especially as public transit is less reliable or not widely available. This paper challenges existing models of generational travel behavior by proposing that a more nuanced understanding of travel behavior requires a more careful consideration of cohort, period and life course effects. This approach allows researchers and policymakers to better formulate strategies that suit the transportation needs of Gen-Z in various global contexts, which will ultimately support the development of more inclusive and sustainable transportation systems.

Some possible weaknesses of this study include limited primary data and limited geographical focus. First, the study relies on a narrative literature review and does not collect primary data itself, which may limit the ability to investigate contextual nuances and differences in depth. The absence of new empirical data means the study tends to rely on interpretations or existing data, which may not fully reflect current or site-specific conditions. This also potentially limits the freshness of the research, as findings may become outdated or inaccurate if the social or technological context has changed. Secondly, the limited geographical focus of this study may affect the generalizability of the findings. This study may only explore Gen-Z travel behavior in some specific geographical contexts, and the results may not be broadly representative or applicable in other locations with very different conditions. This study acknowledges that it does not summarize all existing literature related to Gen-Z travel behavior from different countries, both developed and developing, as that is not the main purpose of this paper. However, despite some weaknesses, this study aims to provide insight into over-generalization of the cohort effect without considering other influential aspects. This study emphasizes the importance of every researcher to include notes in their research, acknowledging that findings could be very different depending on various contextual factors and local conditions, thus providing a more precise understanding of the behavior of the younger generation in the context of global transportation.

This paper underscores the critical need for more research on travel behavior among Generation Z in developing countries' cities, highlighting significant differences in infrastructure, socio-economic conditions, and cultural contexts that influence transportation choices. By advocating for a greater focus on these environments, the study calls on researchers in the field to expand their investigations to include these varied settings. In concluding this literature review, we identified several important research questions that can help direct future research agendas. First, to what extent do transportation infrastructure and socioeconomic conditions in developing countries influence Gen-Z's transportation mode choice? Second, how do cultural differences and local policies affect the adoption of sustainable transportation practices by Gen-Z? Third, in a broader global context, what are the most significant factors influencing Gen-Z travel behavior in different cities around the world? Future research needs to dig deeper to address these gaps and provide more specific and well-

documented insights that will support policymakers and urban planners in designing more inclusive and sustainable infrastructure. By focusing on these questions, future studies can be more targeted and relevant in addressing the complex dynamics of Gen-Z travel behavior. Such research is essential to formulate more effective and contextually relevant transportation policies and innovations, thereby addressing the unique challenges and leveraging opportunities within developing regions. Through a deeper understanding of Gen-Z's transportation preferences and constraints in these areas, policymakers can better tailor strategies that promote sustainable and practical mobility solutions across diverse urban landscapes.

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