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A Systematic Literature Review on the Challenges and Solutions in Public Transportation for Medium-Sized

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Abstract

Public transportation in medium-sized cities faces unique challenges that are often overlooked in national policy formulation. Cities like Jatiwangi are experiencing rapid spatial and economic growth, yet this is not matched by the availability of adequate public transportation modes, in terms of infrastructure, services, and policies. This study employs a Systematic Literature Review (SLR) approach to identify the challenges and solutions in developing public transportation in medium-sized cities, based on 100 selected publications from the year 2000 to 2025. A bibliometric analysis was conducted using VOSviewer to map the relationships among keywords and dominant thematic clusters. The results reveal five main clusters reflecting concerns regarding technological integration, urban growth, policy solutions, infrastructure safety, and sustainable mobility. This review emphasizes the importance of a contextual, adaptive, and locally-driven approach to public transport in non-metropolitan cities. These findings are expected to serve as a foundation for more inclusive and efficient transportation policy decisions in the future.

Keywoard: Public Transportation, Medium-Sized Cities, Urban Mobility Challenges

1. Introduction

The rapid pace of urbanization and population growth has become a serious challenge in managing mobility in medium-sized cities across various parts of the world. The disparity in access to public transportation between major cities and medium-sized cities exacerbates dependence on private vehicles, ultimately leading to congestion, carbon emissions, and social exclusion. In many developing countries, public transportation systems in non-metropolitan areas often lag in terms of service quality, connectivity, and financial efficiency. This situation highlights the urgent need to understand the structural and contextual challenges specific to these regions. In other words, transforming public transportation in medium-sized cities is an integral part of the global effort toward sustainable urban development [1].

At the national level, Indonesia faces similar issues, particularly in secondary and peri-urban cities whose economic roles are beginning to grow. The recent transport policies and policy-related transport research trends, focusing on replacing (passive) car travel with more active modes like walking, cycling and public transport may suggest that there will be increased need for better regional public transport services [2]. Government programs such as the National Infrastructure Development (PINA) and smart city initiatives have yet to fully address the public transportation dimension in medium-sized cities. Cities such as Madiun, Salatiga, and Sukabumi still face significant limitations in providing adequate, affordable, and integrated mass transit services. The existing urban infrastructure cannot support such number of vehicles on the road [3]. Inequitable allocation of regional budgets and weak institutional capacity in the transportation sector remain major obstacles to delivering services that are responsive to citizens' needs [4]. Therefore, research on transportation dynamics outside major urban centers becomes increasingly crucial to bridge the knowledge gaps that have long been overlooked [5].

In West Java Province, the phenomenon of emerging urban areas and suburbanization has increased pressure on local mobility systems. [6]Identifying the challenges and highlighting research gaps. While some cities such as Bandung and Bogor have begun implementing more structured public transportation systems, many other

surrounding areas still lack adequate policy approaches. Persistent issues such as unintegrated spatial planning with transport development, high rates of private vehicle usage, and minimal community involvement in mobility planning continue to hinder systemic transformation [7]. As part of the Bandung Raya and Cirebon Raya buffer zones, Majalengka has become a strategic area that requires greater attention in the context of managing medium-sized city transportation. However, evidence-based studies on this reality remain very limited [8].

Specifically in Jatiwangi District, Majalengka Regency, changes in land use and regional economic growth have triggered a surge in mobility demand. Infrastructure developments such as new collector roads, industrial zones, and commercial activities have significantly increased the volume of daily trips. Ironically, this growth has not been matched by the availability of adequate public transport modes—whether in terms of quantity, coverage, or service quality. Many residents rely on private vehicles and informal, unscheduled transport, resulting in high traffic loads on the area's main roads [9] . This complexity signals the need for policy and public transport planning interventions that are more contextual and sustainable [10].

This study aims to identify and analyze the challenges and solutions in developing public transportation systems in medium-sized cities, with a specific focus on the case study of Jatiwangi as a representation of a growing region. The research adopts a systematic literature review (SLR) approach to formulate thematic patterns from various relevant academic publications [11]. The novelty of this study lies in its integration of multi-level analysis—from global to local—and its emphasis on the importance of designing public transport systems tailored to the specific needs of medium-sized cities, which are often overlooked in national discourse. By presenting a conceptual synthesis and best practices from various regions, this study is expected to contribute to the development of inclusive and adaptive transportation policies that respond effectively to local dynamics [12].

2. Methodology

Due to the limitations of primary data and the diverse urban contexts in medium-sized cities, a systematic literature-based approach becomes essential to obtain a comprehensive and evidence-based understanding [13]. The use of the Systematic Literature Review (SLR) method allows researchers to identify thematic patterns, knowledge gaps, and trends in public transportation solutions that have been implemented in previous studies. To enhance the accuracy of the analysis, bibliometric visualization tools such as VOSviewer are employed to map the interconnections between topics and the frequency distribution of relevant terms in the literature [14].

2.1. Research Approach and Procedures

A Systematic Literature Review (SLR) was employed to comprehensively examine various studies related to public transportation in medium-sized cities [15]. SLR was chosen because it offers a holistic view of the challenges, solutions, and evolving issues in transportation across different contexts and regions. This approach is considered relevant due to the limited number of primary studies focused on non-metropolitan areas like Jatiwangi, making literature-based analysis a strong foundation for building conceptual understanding. By collecting and synthesizing information from various academic sources, this study aims to develop a thematic map that can support the formulation of more context-specific public transportation strategies [16].

The procedure began with the formulation of research questions, followed by the search for articles through databases such as Google Scholar and Scopus, using relevant keywords [17]. Retrieved articles were then screened based on inclusion and exclusion criteria, such as topic relevance, publication year range, and journal credibility. Selected literature was analyzed qualitatively to identify recurring thematic patterns and underexplored research gaps [18]. The results of this analysis form the basis for developing a conceptual framework and guiding the formulation of public transportation policies that align with the characteristics of medium-sized cities [19].

2.2. Literature Collection and Selection Techniques

Literature collection in this study was conducted through two main academic databases—Google Scholar and Scopus—assisted by the Publish or Perish (PoP) software to facilitate the search and management of bibliographic data [20]. The search process used a combination of keywords such as *"public transportation," "medium-sized cities," "urban mobility challenges,"* and *"transport policy in developing countries."* These keywords were selected to cover a broad range of perspectives, from systemic challenges to policy approaches. The time span for the literature search ranged from the year 2000 to 2025, in order to capture long-term developments in public transportation research while maintaining relevance to current conditions.

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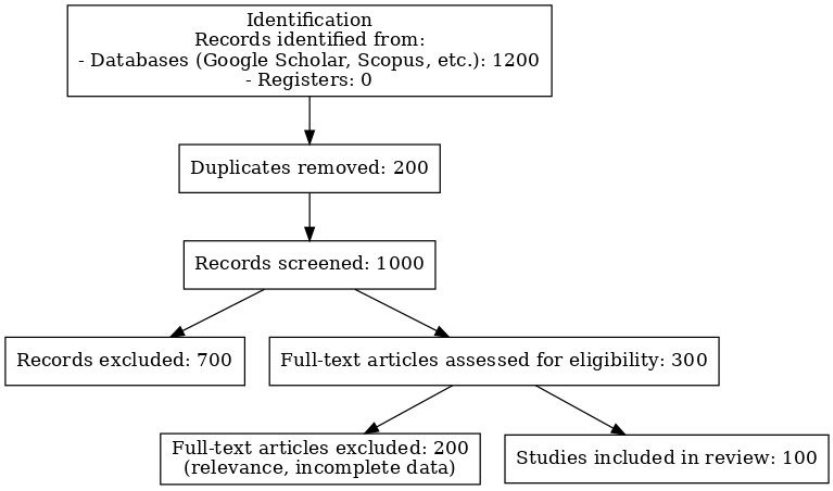

Figure 3.1. Flowchart of Study Identification through Databases and Registers

The flowchart illustrates the process of identifying and selecting articles in this study. A total of 1,200 articles were identified through various databases such as Google Scholar and Scopus. After removing duplicates, 1,000 articles were screened based on their titles and abstracts. Of these, 300 articles were fully evaluated for eligibility. As a result, 200 articles were excluded due to irrelevance or incomplete data, leaving 100 articles that met the criteria and were included in this literature review.

2.3. Literature Collection and Selection Techniques

Data analysis in this study was conducted using a thematic analysis approach to identify key issues, along with bibliometric analysis to support the visualization of relationships between topics in the reviewed literature [21]. The selected articles were manually analyzed to classify key findings into themes such as institutional challenges, modal integration, accessibility, and public transport policy in medium-sized cities. This process was carried out inductively, where themes were determined based on the content trends of each article rather than predefined categories. In this way, the researcher was able to explore relationships between ideas and compare the approaches used across different studies and regions [22].

To strengthen the analysis and display visual patterns, this study utilized the VOSviewer software [23]. Bibliographic data from the selected articles were exported in the appropriate format and processed using VOSviewer to generate visual maps based on keyword co-occurrence, co-word mapping, and the distribution of dominant themes over time. This visualization helped identify the most frequently occurring research clusters and revealed the interconnections among commonly used concepts in studies of medium-sized city transportation. The findings from this visual analysis were used to reinforce the interpretation of the literature synthesis and served as the basis for drawing conclusions and formulating recommendations in the final saection of the study [24].

3. Result and Discussion

3.1. Thematic Synthesis of Literature Review

A search strategy was developed to encompass keywords relating to patient-partners in research, their experience, and the qualitative nature of the target studies [25]. Based on the selection and analysis of 1,000 articles published between 2000 and 2025, it was found that public transportation issues in medium-sized cities remain an underrepresented topic in global transportation discourse. Bibliometric analysis using VOSviewer produced visualizations of the relationships among keywords used in the reviewed articles. To support the synthesis of the literature, keyword relationship mapping was carried out using the VOSviewer software. This technique was employed to identify patterns of topic interconnection that frequently appeared in the literature during the 2000–2025 period. The resulting visualizations provided an overview of dominant clusters in the literature related to public transportation in medium-sized cities, as well as illustrated research trends and the interconnectedness of key concepts [26].

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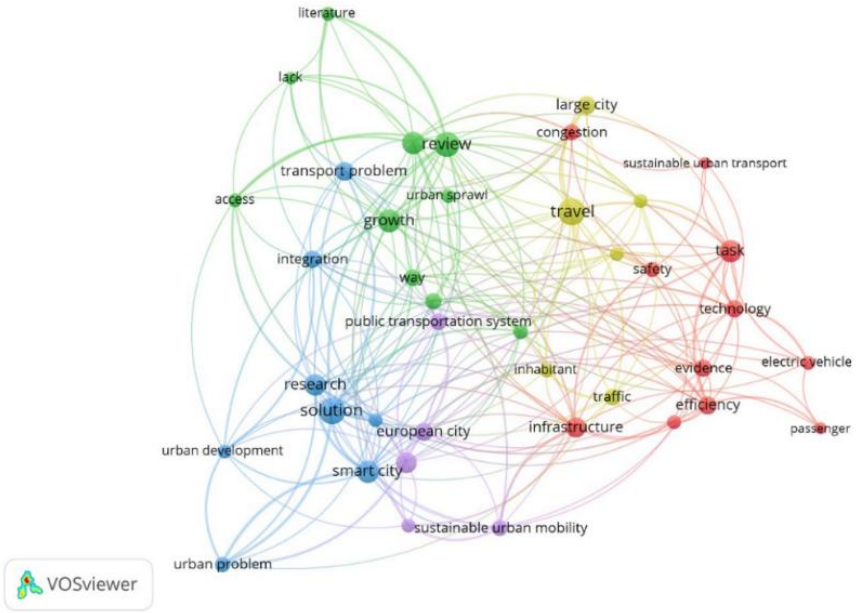

Figure 4.1. Keyword Visualization Map Generated by VOSviewer Showing Five Main Thematic Clusters in the Literature on Transportation in Medium-Sized Cities

The bibliometric mapping results using VOSviewer illustrate the co-occurrence relationships among keywords from the various publications reviewed in this study. This visualization forms five main thematic clusters, each represented by a different color. The red cluster focuses on issues of technology and efficiency, with keywords such as *task, technology, electric vehicle,* and *efficiency*, reflecting a trend toward technology-driven and environmentally friendly transportation development. The green cluster emphasizes urban growth challenges, access inequality, and literature critique, with terms such as *growth, urban sprawl, lack,* and *review*. The blue cluster represents efforts toward solutions and integration, including keywords like *integration, research, solution,* and *smart city*. Next, the yellow cluster highlights themes of infrastructure and travel safety, shown through terms like *travel, safety, traffic,* and *inhabitant*. Finally, the purple cluster raises the concept of *sustainable urban mobility* and *European city*, indicating the influence of sustainable approaches from European cities in the development of public transportation. Overall, this visualization affirms that the literature on transportation in medium-sized cities is multidimensional, involving the integration of technology, policy, and spatial conditions that are closely interconnected.

In a literature review, analyzing the most frequently occurring keywords is essential for identifying the main research focus and emerging topic trends. Understanding the dominant keywords and their relevance allows researchers to comprehend the trajectory of previous studies and develop a more structured theoretical framework or conceptual model. Therefore, a data visualization in the form of a graph was created to display the relationship between keyword frequency and their relevance to the research theme. The following figure presents the results of this analysis in a horizontal bar chart.

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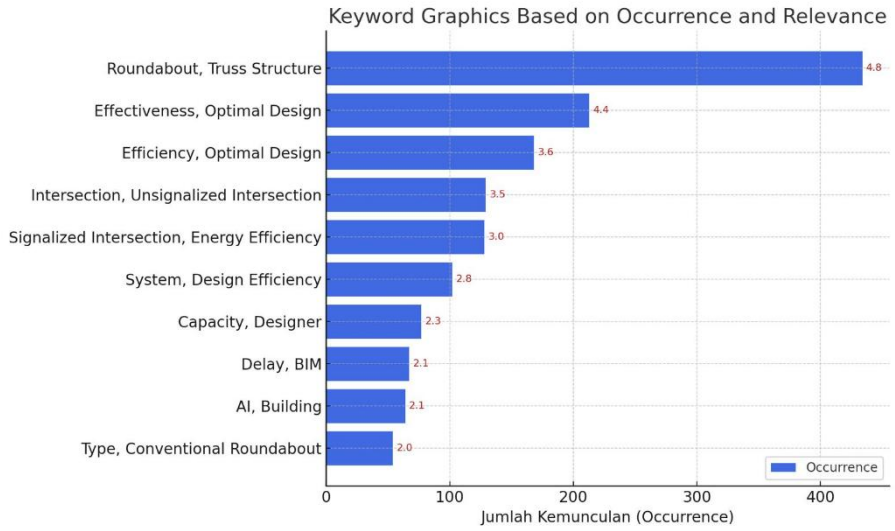

Figure 4.2. Keyword Graphics Based on Occurrence

The figure presents a horizontal bar chart displaying the distribution of keyword pairs based on their frequency of occurrence and level of relevance in a literature review or analysis. The most prominent keywords are *"Roundabout, Truss Structure"*, with the highest occurrence—over 400 times—and the highest relevance score of 4.8. This indicates that topics related to roundabouts and truss structures are a major focus in the discussion. Next, the keyword pairs *"Effectiveness, Optimal Design"* and *"Efficiency, Optimal Design"* also appear frequently, with relevance scores of 4.4 and 3.6 respectively, indicating significant attention to efficiency and optimal design in the context of planning or engineering. Other topics such as *"Intersection, Unsignalized Intersection"*, *"Signalized Intersection, Energy Efficiency"*, and *"System, Design Efficiency"* also occur frequently and are relevant, reflecting the importance of intersection design and energy efficiency [27].

Meanwhile, some emerging topics such as *"Delay, BIM"*, *"AI, Building"*, and *"Type, Conventional Roundabout"* appear with lower frequencies and relevance scores, indicating that newer technologies like Building Information Modeling (BIM) and artificial intelligence are beginning to enter the discussion, although they are not yet dominant themes [28]. Overall, the chart provides an overview of a strong research focus on traffic infrastructure design and efficiency, with a growing trend toward the integration of modern technologies.

3.2. Visualization

In addition to keyword network mapping, the analysis is also complemented by a density visualization to identify the most frequently occurring and most central keywords within the reviewed literature. This visualization provides a quantitative representation of the influence and interconnectedness of specific topics within the discourse on public transportation in medium-sized cities.

The colors in the map indicate the frequency and strength of keyword associations: the brighter the color (yellow), the higher the intensity of its occurrence in the literature. From this visualization, it is evident that keywords such as *review, solution, travel,* and *smart city* appear in the brightest areas, indicating that these themes are central focuses in research on transportation in medium-sized cities [29]. Meanwhile, keywords in darker areas suggest topics that appear less frequently or have weaker connections to the main themes. This map helps clarify the focus of existing literature and supports the identification of dominant areas while also pointing toward potential research gaps that have not yet been thoroughly addressed.

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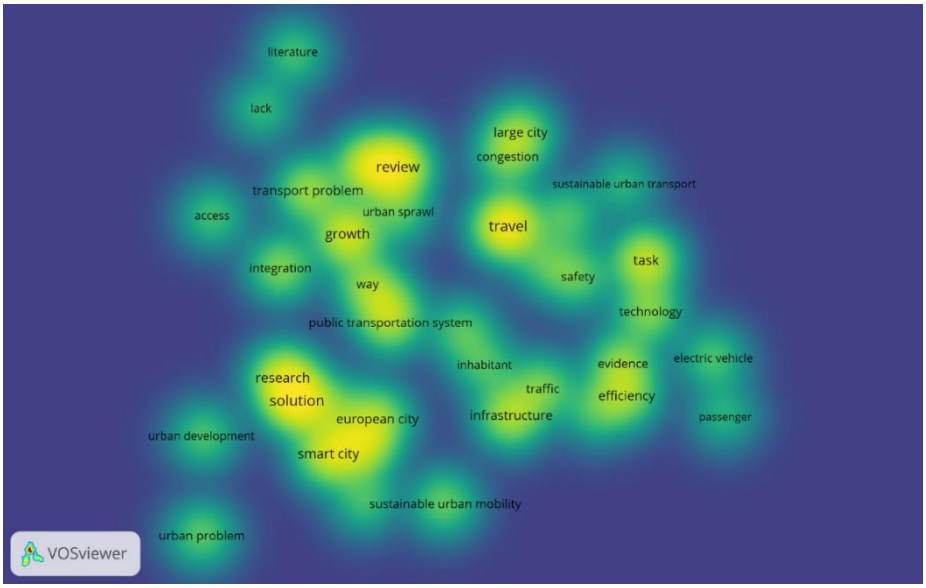

Figure 4.3. Keyword Density Map Generated by VOSviewer; yellow indicates dominant keywords such as "review," "solution," and "smart city".

Keyword by Highest Studies

No.	Keyword	Frequency
1	urban	1129
2	transport	914
3	medium	760
4	size	750
5	public	724
6	cities	669
7	mobility	528
8	transportation	405
9	problems	330
11	transit	330

Figure 4.4. Table of Keywords by Highest Studies

The "Highest Studies" table displays the eleven most frequently occurring keywords in the analyzed body of literature, illustrating the main thematic focuses of the studies [30]. The word *"urban"* ranks the highest with 1,129 occurrences, indicating the dominance of urban issues in the academic discourse, followed by *"transport"* with 914 occurrences, emphasizing the central role of transportation systems in the urban context.

Keywords such as *"medium," "size,"* and *"public"* reflect the attention toward city size classification and public transportation. Meanwhile, the frequent appearance of terms like *"cities," "city," "mobility,"* and *"transportation"* suggests that many studies address the dynamics and challenges of urban mobility and spatial management. The inclusion of *"problems"* and *"transit"* also indicates that technical and operational issues within transportation systems are key concerns. Overall, this table highlights that the dominant research themes revolve around transportation planning and efficiency in urban areas, as well as the complexities arising from city growth and increasing mobility demands.

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3.3. Research Type Determined by Publisher and Classification of Research

To identify the dominant sources of references used in this review, an analysis was conducted on the most frequently appearing publishers in the bibliographic data [31]. This was aimed at determining the extent to which each publisher has contributed to distributing literature related to the research topic. [32]The results of the analysis were then visualized in the form of a horizontal bar chart, showing the number of publications from the top 15 publishers based on frequency of appearance.

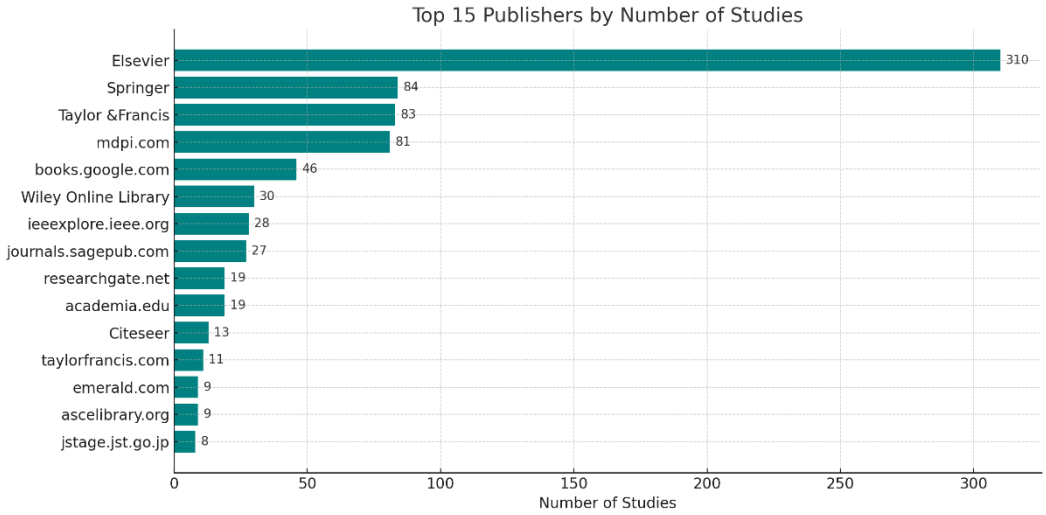

Figure 4.5. Table of Keywords by Highest Studies

This visualization displays the number of scientific publications from the top 15 publishers that contributed the most references in the analyzed dataset. The publisher with the largest contribution is Elsevier, dominating with a total of 310 studies, underscoring its role as a primary source for disseminating scientific literature, particularly in the fields of engineering, transportation, and urban studies. Following Elsevier are Springer (84 studies), Taylor & Francis (83 studies), and MDPI (81 studies), all of which are major publishers with multidisciplinary journal coverage, including urban studies, mobility, and infrastructure innovation. The appearance of Google Books, with 46 entries, indicates the inclusion of academic books or research reports available digitally.

In addition, the chart highlights the diversity of scientific information sources used, with other contributors such as Wiley Online Library, IEEE Xplore, SAGE Journals, and research-sharing platforms like ResearchGate and Academia.edu, though their contributions are smaller in number [33]. The presence of CiteSeer, Emerald, and the ASCE Library also demonstrates that the reviewed research spans beyond general journals to include civil engineering and urban management domains.

Through this visualization, it can be concluded that the distribution of studies in the examined field heavily relies on the world's major academic publishers. This indicates a concentration of literature within trusted academic channels and highlights the need for broader access to diverse sources to enrich and diversify the findings of future reviews [34].

4. Conclusion

This study concludes that the challenges of public transportation in medium-sized cities are complex and have not received adequate attention in national policy discourse or global academic research. Cities such as Jatiwangi, which are experiencing rapid economic growth and spatial transformation, face mobility pressures that are disproportionate to the capacity of existing public transportation systems. Key contributing factors include inadequate infrastructure, weak institutional capacity, spatial planning disparities, and the dominance of private vehicles, all of which worsen mobility quality. Through a Systematic Literature Review (SLR) of over 1,000 scholarly sources, this study identified five main thematic clusters: (1) technological efficiency, (2) urban growth and access inequality, (3) integration and policy solutions, (4) infrastructure and travel safety, and (5) sustainable mobility inspired by European urban experiences. Bibliometric visualizations revealed that topics such as *urban*

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transport, smart city, public mobility, and *sustainable transit* dominate the academic discourse, with major publishers like Elsevier and Springer emerging as the most significant sources of literature [35]. This study makes a valuable contribution by offering a thematic map and strategic recommendations for the development of public transportation systems that are more contextual, adaptive, and responsive to local needs—particularly for medium-sized cities in Indonesia and other developing countries.

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