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Capacity in Transportation Systems: A Bibliometric of Local Road Capacity on the Middle City Scale

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Abstract

This study conducts a bibliometric examination of academic literature related to transportation system capacity, with particular focus on local road networks in medium-sized urban areas. Utilising data sourced from reputable academic databases and analysed using VOSviewer software, the study identifies significant trends, patterns of collaboration, and dominant research themes within the field. The results indicate a marked increase in scholarly attention over the past decade, particularly in areas such as urban mobility, traffic congestion, sustainability, and the integration of emerging technologies, including artificial intelligence and intelligent transportation systems. Visualizations of keyword co-occurrence and publication trends highlight the interdisciplinary nature of transportation research, which encompasses engineering, urban planning, and environmental disciplines. The findings from this analysis are intended to support researchers, policymakers, and urban development practitioners in designing transportation strategies that are both effective and sustainable in addressing the dynamic challenges of urban environments

Keywords: Transportation System, Capacity, Local Road, Middle City, Urban Transportation

1. Introduction

In some European countries, construction has become one of the country's most important projects. In addition to construction development, transportation has also become one of the important issues in some countries. Human civilization is fundamentally shaped by construction activities, which form the foundation of urban development, residential spaces, and critical infrastructure [1]. Numerous countries worldwide are adopting sustainable highway development approaches to address a wide range of infrastructure demands [2]. The swift advancement of science and technology in the modern era is reflected in the continuous development and enhancement of urban transportation systems. [3]. Traffic flow capacities and conditions are inherently linked to intersections within the road network, with each intersection potentially operating in one of three traffic conditions: free flow, impaired flow, or congested flow [4]. Despite extensive research in the field of traffic management, road congestion remains a significant challenge to both transportation authorities and road users [5]. Construction projects often face complex conditions and potential risks, such as work-related accidents, that can impact efficiency, efficacy, quality, and cost [6].

Indonesia is classified as one of the nations with the highest population globally. [7]. In the current context, countries are becoming increasingly vulnerable to the impacts of climate change, resulting in a higher frequency of disasters [8]. Indonesia is currently undergoing a period in which each region must give serious consideration to its development strategies and construction practices [9]. Well-functioning infrastructure, such as road and rail networks, is a key factor in the country's economic growth. [10]. Infrastructure development also involves several aspects, one of which is transportation. Transportation systems are the backbone of economic and social activity, enabling the efficient movement of people and goods across regions. The high population density in Indonesia has contributed to a rise in both traffic congestion and the incidence of road accidents. [11]. Transportation problems are closely related to congestion, delays, and pollution caused by vehicles, including both air and noise pollution, which are common in many major cities in Indonesia [12].

West Java is the most populous province on the island of Java. In urban areas, where population density and travel demand are on the rise, understanding and optimizing system capacity is becoming increasingly crucial. Transportation by road is the only mode to provide full service to everyone. [13]. Motor vehicles are still the preferred mode of transportation due to their convenience and practicality [14]. One of the fundamental aspects that determines the performance and reliability of a transportation system is its capacity. When there is heavy traffic, it may be quicker to walk a short distance. [15].

One of the key benchmarks for a region's success is its economic growth. [16]. The city of Majalengka is among several urban areas currently engaged in developing road infrastructure. [17]. In the context of regional planning and national development, transportation acts as a link between centres of economic activity, education, and public services [18]. The high level of community mobility must be supported by adequate transportation facilities and infrastructure, including the provision of efficient and reliable public transportation to help reduce dependence on private vehicles. Given the large proportion of road space occupied by motorcycles at signalized intersections, Exclusive Stopping Spaces (ESS), also known as red boxes, have been introduced to manage the position of motorcycles [19]. Congestion, delays, increased travel costs, and environmental damage are direct consequences of a transportation system operating near or beyond its capacity limits. Therefore, proper capacity assessment is essential not only for traffic engineering and operations but also for long-term urban and regional transportation planning. Traffic congestion is considered a worldwide problem, as it leads to higher levels of air pollution, increased vehicle noise, and longer trip durations for both private and public vehicles [20].

Public transportation serves as the backbone of urban mobility systems worldwide, particularly in densely populated metropolitan areas. It is characterized by the use of high-capacity vehicles operating along fixed routes and schedules [21]. Very often, traffic conflicts can lead to accidents and traffic jams [22]. The concept of transportation capacity varies depending on the mode of transportation, including highway, rail, public transport, or a multimodal network. Demand for transportation is a secondary need that arises as a consequence of economic, social, and other related activities [23]. In the context of public transportation, capacity is also strongly influenced by service frequency, vehicle size, and the efficiency of the boarding and alighting system at stops or stations. The concept of capacity becomes even more complex in multimodal network systems, where interactions between different modes of transportation can affect overall capacity. Capacity analysis, therefore, needs to be thorough, taking into account the local context, the technologies used, and the social and economic dynamics that influence mobility demand. This study employs a bibliometric analysis method using VOSviewer, a tool that enables the exploration and analysis of scientific data, allowing researchers to describe phenomena and their characteristics [24]. This study aims to identify research trends, examine collaboration patterns among scholars, and analyze the dissemination and impact of scientific publications related to this field. These findings are expected to make meaningful contributions to both researchers and professionals involved in the planning and development of high-rise buildings.

2. Research Methods

This research utilises a method that involves identifying relevant studies, journals, network data, and research developments using standardised parameters. These parameters were aligned with the subject matter of the research, which focused on the heat resistance of metal materials [25]. Bibliometric analysis focuses on the statistical examination of various forms of published works, including books, scholarly articles, datasets, and online resources, as well as their related metadata, such as abstracts, keywords, and citation records. This approach is used to describe patterns and reveal relationships among published works [26], by collecting the scientific data on which this research is based was obtained from the Elsevier Scopus database [27], then analyzing them using VOSviewer software to identify research trends, collaborations between authors and institutions, and dominant topics that are developing in the field, to provide an overall picture and future research directions. The research method employed in this study comprises a literature review and desk research utilizing academic databases [28].

2.1. Data

The practice of making data publicly accessible has become a standard practice within the proteomics research community. [29]. Data serves as a fundamental element in bibliometric studies, playing a vital role in illustrating the progression of research on transportation system capacity, with a specific focus on local road capacity in medium-sized urban areas. Data collection in this study was conducted using reputable scientific databases, including Scopus and Web of Science. Continuous advancements in urban transportation systems illustrate the broader acceleration of science and technology. Data sources, including journal articles, books, datasets, and

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technical reports, were extracted using targeted keywords and organized in RIS format for subsequent analysis. [30]. Then, it was analyzed to identify research trends, collaboration among authors, and dominant topics in the field of road capacity management.

Data processing involves a systematic set of steps, from initial document selection to filtering based on publication year, document type, and suitability for the topic at hand. VOSviewer software was used to analyze a dataset comprising research titles, authors, publication dates, and journal sources. [31]. Visualization of collaboration networks, keyword associations, and temporal research trends was conducted to provide a holistic understanding of research activities on local road capacity in medium-scale cities.

The dataset examined also encompassed details regarding the originating countries of the studies, the affiliated institutions, and the primary journals in which the findings were published. Notably, the term “analysis” emerged as the most commonly recurring keyword across a corpus of 1,000 interconnected journal articles. [32]. Thus, this study not only captures the technical aspects of road capacity but also shows a map of collaborations and research centres that play a dominant role in the development of transportation science. This allows researchers to identify research gaps and potential future collaborations.

The analysis reveals a strong correlation between researcher impact, institutional visibility, and the intensity of collaborative research networks [33]. To understand the direction and development of local road capacity studies. The findings from the data are expected to contribute to the formulation of transportation policies that are more adaptive to the needs of medium-sized cities and support the development of a competitive and sustainable road system. The data will also serve as a valuable reference for future researchers exploring aspects that have not yet been thoroughly examined.

The data used are selected journals from several available on Google Scholar, identified by the keywords "Transportation System," "Capacity," "Local Road," "Middle City," "Urban Transportation," "Traffic Flow," "Analysis," "Roadway," "Performance," and "Bibliometric Analysis," resulting in a total of 1,000 journals from the Publish or Perish filtering results.

2.2. Data Collection

Identifying the type of data required is a crucial step in determining the appropriate data collection method. This section summarises the possible data types, associated collection techniques, and appropriate data sources within each category [34]. The data collection process began with determining appropriate and specific keywords, such as "Road Capacity," "Transportation Systems," "Local Road," and "Middle City." These keywords were combined using Publish or Perish to identify similar journals worldwide that are linked to the research under review [35], thereby obtaining more focused search results. Furthermore, inclusion and exclusion criteria were established to eliminate irrelevant documents, including non-scientific publications, articles unrelated to road capacity, and materials that fell outside the defined research period. The subsequent stage of data collection involves converting the database generated by Publish or Perish into a bibliometric map using VOSviewer software [36]. This process ensures that all the necessary information is available for further analysis, both in terms of visualizing the research network and identifying emerging topic trends.

Through a structured and rigorous data collection approach, the research gathered information representative of the growing body of knowledge on road capacity at the local level. The data obtained not only mapped the extent to which this topic has been studied but also helped identify areas that remain underexplored. As such, data collection is a crucial foundation for producing accurate bibliometric analyses that will benefit the development of transportation systems in medium-sized cities.

2.3. Data Analysis

Analyze the data in this research using the bibliometric analysis method to examine a keyword. [37]. Data collected from various scientific publications were processed and analyzed using the VOSviewer software. This application can be used to retrieve and analyze [38]. This enables the visualization of relationships between keywords, authors, institutions, and countries. The analysis emphasizes the evolution of research across time and highlights the multidisciplinary character of studies in this field [39]. It aims to assess the extent to which the research has progressed and its relevance to the various parties involved.

The analytical process was initiated by constructing a keyword co-occurrence map using VOSviewer, utilizing keywords provided by the authors to identify thematic relationships within the literature [40]. This visualization

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displays the most dominant keywords and their relationship to the two topics. Additionally, a co-authorship analysis was conducted to evaluate the collaboration between authors and institutions involved in road capacity research, thereby identifying centres of research excellence in this field.

The following analysis focuses on evaluating publication trends by year of publication, providing insight into the growth of research interest in local road capacity in medium-sized cities over time. In this way, it is possible to identify periods when the topic has experienced either an increase or a decrease in attention. Additionally, journal sources were analyzed to identify the primary and most prolific publications in this field.

Results from the data. This analysis encompasses the creation of author, journal, and keyword rankings, as well as the development of a visual network model that maps the interconnections among articles within the dataset. [41]. Provides an in-depth understanding of scholarly developments and potential future research directions. This thorough analysis not only illustrates the current research landscape but also helps identify open research gaps that could be the focus of future studies. As such, the data analysis is an important part of strengthening the contribution of this research to the development of transportation systems, particularly regarding the capacity of local roads in medium-sized cities.

3. Results and Discussions

The research results are presented coherently and systematically to form a logical storyline. Relevant facts and data support the presentation of results. Tables and figures can be used to clarify information, but the same data should not be presented repeatedly in the form of figures, tables, or text. To clarify the description, the use of subheadings is highly recommended.

The discussion provides fundamental explanations, highlights relationships, and presents generalizations derived from the research findings. This section is intended to answer the research questions posed. Any uncertain or questionable results should be presented objectively and transparently.

3.1. *Specifications*

This study was conducted by gathering and structuring data using the Publish or Perish application, employing keywords that accurately represent the research theme. The collected data were then processed using VOSviewer to visualize the relationship, density, and year of publication of the selected literature. In addition, the data were analyzed and presented in tables and graphs, using percentages and numerical values derived from international journal publications [42]. This network visualization, generated using VOSviewer, illustrates the interconnections among frequently occurring keywords within the body of literature on transportation system capacity. VOSviewer is a dedicated software application designed to create and visualize bibliometric maps based on network data. Although primarily developed for analyzing academic literature, it has applications that extend to various types of network data, including social networks. The software facilitates the exploration of various relational structures, including co-authorship networks, keyword co-occurrence, citation patterns, bibliographic merging, and co-citation relationships [43]. Each node in the visualization corresponds to a keyword, where node size reflects its occurrence frequency. Keywords such as *capacity*, *ability*, *urban mobility*, *bibliometric analysis*, and *transport* exhibit larger nodes, signifying higher relevance within the publication set.

The application enables researchers to identify new contributions in a particular research domain by effectively mapping and representing key topics. Moreover, once the data is entered, the software facilitates the detection of emerging trends, the identification of significant keywords, and the visualization of the trajectory of topic frequency evolution over time. VOSviewer, in particular, plays a crucial role in generating bibliometric visualisations that enhance the clarity and interpretability of the analysed literature landscape. [44] This visualization also illustrates the relationship between the depicted keywords using connecting lines (edges). Thicker lines indicate stronger linkage, meaning that the keywords often appear together in the same literature. This relationship establishes a complex network, illustrating how various concepts are interconnected in the study of transport and mobility. This network also facilitates the identification of keywords that connect various research themes. When visualising research development mapping globally, VOSviewer is particularly helpful in visualising research networks. VOSviewer helps map starting from authors, research documents, researcher countries, etc. [45]

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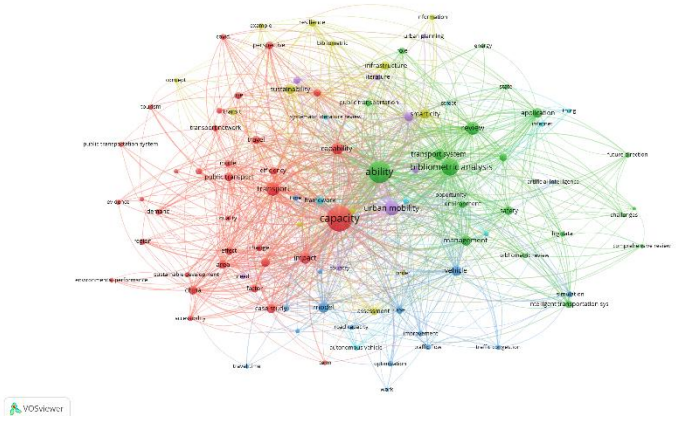

Figure 1 Network Visualization

Keyword co-occurrence and clustering: Thematic clusters within urban transportation research were identified using the VOSviewer software. Two primary clusters emerged: one on sustainable urban mobility and another on motor transportation efficiency These clusters correspond to red (sustainability, capacity, demand), green (bibliometric/system review), blue (simulation, autonomous vehicles), and additional smaller yellow and purple clusters on resilience, smart cities, and infrastructure. [46] Each keyword group is classified into several clusters, differentiated by colour. The red cluster encompasses issues related to transportation, capacity, efficiency, demand, and sustainable development. The green cluster focuses more on bibliometrics, literature review, and transportation systems. Blue clusters are closely related to transportation models, simulations, and technologies such as autonomous vehicles. Meanwhile, the yellow and purple clusters represent more specific themes such as resilience, smart city, and infrastructure. The degree of keyword density reflects the degree of interconnectedness among the elements in the network. In network analysis, density is determined by calculating the ratio of the actual number of connections to the total number of possible connections within the network structure [47].

The network is represented as a network of interconnected lines in the VOS Viewer application, where the creative network is more visible than others. This indicates that the term 'creativity' is widely used in related papers. [48]. Overall, the visualization provides a comprehensive representation of the research landscape within the domain of transportation system capacity and bibliometric analysis. The network that has been formed reflects the diversity and depth of research that covers issues of technology, sustainability, urban planning, and transportation infrastructure development. By understanding the linkages between these keywords, researchers can identify research trends, knowledge gaps, and potential future topic development. Consequently, visualization influences the scale of the network presented in the output, determining the extent to which entities are represented in terms of quantity and visibility [41].

3.2. Density Visualization

The Density Visualisation image is the result of a bibliometric analysis that illustrates the distribution of keywords in studies related to the capacity of transportation systems. In item density visualisation, each item is displayed using its label, and each point in the visualisation is colour-coded to reflect the density of items in a particular area. The default colour gradient transition is from blue to green to yellow. A higher concentration of items, along with a greater weight of adjacent items, results in a colour shift closer to yellow. Conversely, areas with fewer items and lower weights are represented by colours closer to blue [49]. The colours in the visualisation indicate the intensity or density of a particular keyword's occurrence in the analysed literature. The lighter the colour displayed (towards yellow), the higher the frequency or significance of the keyword in the research network. In contrast, darker colours (blue to green) indicate keywords with lower frequency or relevance.

Overlay visualisation was employed to explore trends in emerging research themes identified in the analysed documents. This method utilizes color gradients to emphasize the significance and progression of particular themes, offering a clearer understanding of the evolution and advancement of research topics over time. [50]. It can be seen that the most prominent keywords at the centre of the visualization are "capacity," "ability," "bibliometric analysis," and "urban mobility." These words indicate the central theme in the literature review analyzed, namely the focus on the capacity of the transportation system, the capability or performance of the

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system, and the bibliometric approach used to evaluate various studies related to urban mobility. These four keywords become the centre of gravity that connects various other terms around them.

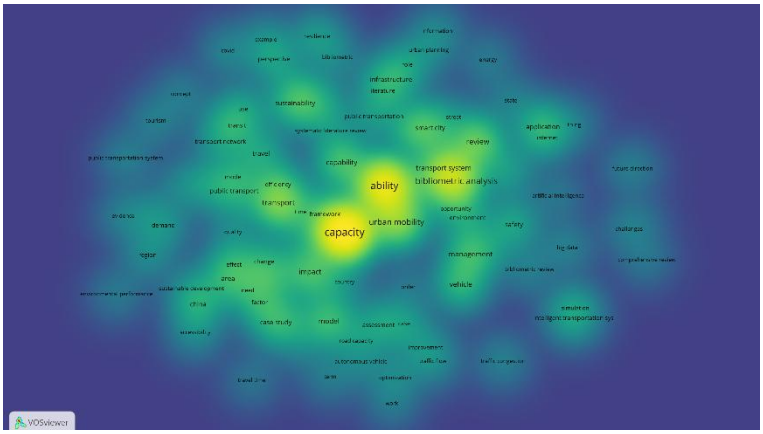

Figure 2 Density Visualization

Around the centre, there are supporting keywords such as "transportation," "public transport," "sustainability," "infrastructure," "review," and "management," which have a medium density level. These terms enrich the analysis by introducing additional dimensions related to transportation issues, such as sustainability, system management, and infrastructure needs. The presence of words such as "smart city," "artificial intelligence," and "autonomous vehicle" reflects the trend of future-oriented research in the development of technology-based transportation.

Meanwhile, on the outside of the visualization, there are keywords with lower intensity, such as "tourism," "covid," "environmental performance," "big data," and "simulation." These words highlight specific issues that may only be briefly addressed in a small portion of the literature, yet remain relevant. These visualizations help identify not only dominant themes but also potential new research directions and the integration of cross-disciplinary topics in the study of transportation system capacity.

3.3. Publications Development by Year

Trend mapping is conducted as a preliminary step prior to clustering and research mapping. Furthermore, the analysis is organized by publication year for each article. The information derived from the overlay visualization serves as a basis for assessing the outcomes of keyword analysis in the research. [51].The first image displays a graph of the distribution of publications per year, illustrating the growth trend in research related to the topic under study. From 2002 to approximately 2017, the yearly publication output remained consistently low and stable, averaging fewer than three publications per year. However, starting in 2018, there was a significant increase, with a sharp spike in 2021, followed by 88 publications in 2022, and then 146 publications in 2023, culminating in a peak of 250 publications in 2024. The year 2025 is also showing a strong trend, with 130 publications, although the year is not yet entirely over. This graph shows that the research topics analyzed have become increasingly relevant and in demand in recent years.

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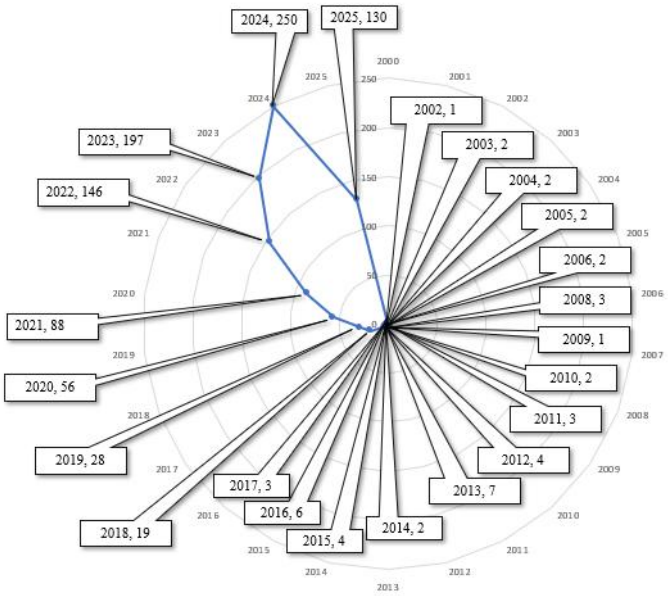

Figure 3 Annual Publication Trend

The second picture is Overlay Visualisation. VOSviewer provides three types of visualization: network, density, and overlay. Overlay visualization is used to illustrate the time dimension by utilizing color gradients that range from blue to yellow. [52]. Overlays visualization is used to identify temporal trends in scientific outputs by mapping average publication years of keywords or authors. [53].which describes the relationship and occurrence of keywords in research based on the time of publication. This overlay visualization not only highlights the popularity of terms across different years but also uses distinct colours to indicate the temporal evolution of each term. Within this visualization, the darker hues, which tend towards purple, signify that research on a specific term was predominantly conducted around the year 2018. Conversely, the lighter shades, verging towards yellow, represent terms that have emerged more recently in contemporary research [54]. The colour in the visualization shows the average year the keyword appeared. Keywords with blue to purple tones predominantly appear earlier (around 2022), while keywords with green to yellow tones indicate newer and emerging topics from 2023 to 2025. For example, terms such as "capacity," "urban mobility," and "ability," which are centred in blue, tend to indicate long-term consistency and relevance in the literature.

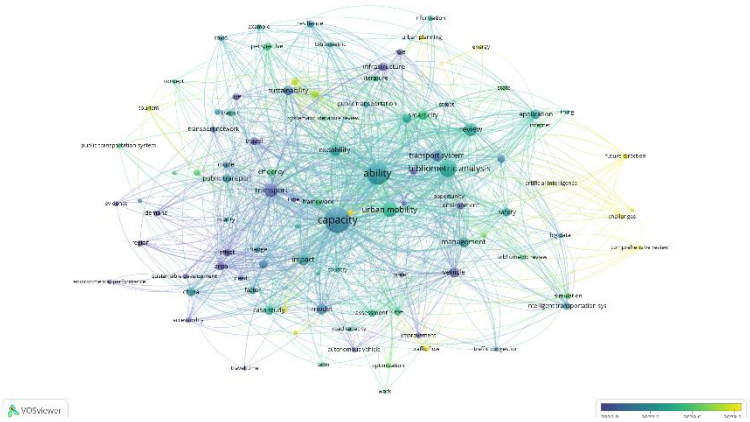

Figure 4 Overlay Visualization

This visualization also highlights emerging topics that are gaining prominence and are the focus of the latest research, characterized by a greenish-yellow color. Keywords such as "artificial intelligence," "big data,"

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"comprehensive review," "future direction," and "intelligent transportation sys" show that technological innovation and the use of big data are beginning to dominate the study of transportation and road capacity. This indicates a shift in research attention from conventional themes to a more modern and technology-based approach.

From the relationship between closely established keywords, it can be seen that the literature in this field is highly integrated with various supporting topics such as "sustainability," "management," "public transportation," and "traffic flow." The strong relationship between these terms reflects the multidisciplinary nature of transportation research, which encompasses technical, social, and environmental aspects. In general, the visualization offers an in-depth depiction of the evolving trends, strategic directions, and core research areas within the domain of capacity-oriented transportation and mobility.

3.4. Research by Publisher

The figure above illustrates the distribution of publication volumes according to journal publishers that have contributed the highest number of articles within the analyzed field of study. MDPI.com publishers significantly dominate, with the number of publications reaching approximately 250 articles. This indicates that MDPI is one of the primary platforms used by researchers to publish studies related to this topic, which are typically within the fields of science, technology, and sustainability. In our bibliometric study of goods transportation, Elsevier journals dominate the field, followed closely by Springer publications, which collectively account for nearly 60 % of total publications in the domain. [55]

In second and third place are publishers Elsevier and Springer, each with several publications comprising around 80 to 70 articles. These two publishers are widely recognized as major players in the world of scientific publications, with a diverse range of reputable journals spanning various fields, including transportation, civil engineering, and environmental studies. Elsevier and Springer Nature rank among the top publishers in transportation research, regularly publishing high-impact journals such as *Transportation Research Part A–F, Transport Policy, and Journal of Transport Geography.* [56]. This indicates that research related to capacity and transportation systems has also received attention in more established and prestigious international journals.

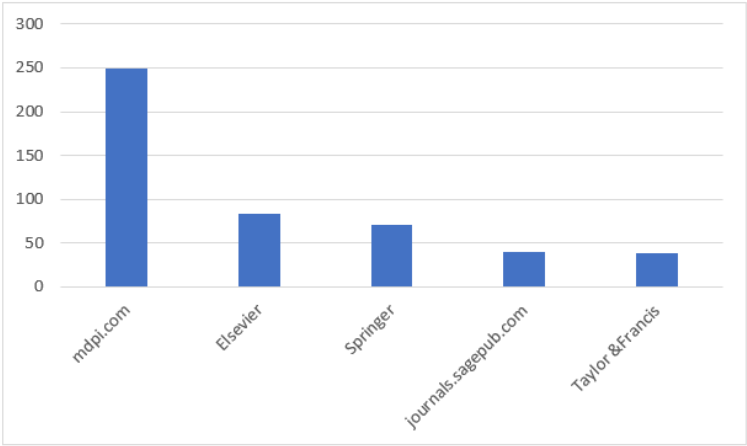

Figure 5 Study Publisher

By using the Publish or Perish database, we can obtain publication types as one of the information to use. The data collected from the 'publish or perish' will then be exported to Microsoft Excel for processing. The data was then converted into a chart to illustrate the most popular types of publications related to the topic. [57]. Meanwhile, the other two publishers, journals.sagepub.com and Taylor & Francis, ranked fourth and fifth, with the lowest number of publications, each with fewer than 50 articles. Although the number is smaller, the presence of these two publishers still shows that the research topics studied have received attention on various scientific platforms on a global scale. It also shows the diversity of publication channels chosen by the researchers. Taylor & Francis and SAGE Publications, while not as voluminous as Elsevier or Springer, have established themselves as significant publishers in transportation studies, particularly in policy, behavioural, and sustainability dimensions. [58]. Based on the database, ten publishers are associated with keywords, particularly

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those related to civil engineering. "Publish or perish" can also indicate which publishers have contributed the most to the author's keywords. [59].

Overall, this graph indicates a notable concentration of publications from a single publisher, specifically MDPI, with a substantially higher proportion compared to other publishers. This trend can be attributed to the ease of access, speed of publication, and interdisciplinary topics facilitated by MDPI. However, the role of other major publishers is to demonstrate that this study is global, multidisciplinary, and relevant within the scientific community worldwide. MDPI has become one of the largest open-access publishers globally, recognized for its rapid peer-review system and interdisciplinary journals, including *Sustainability*, *Applied Sciences*, and *Energies* [60]. The visualization illustrates the distribution of authors based on data extracted from the Publish or Perish software, enabling the exploration of connections between authors. The brightest colours in the image show the most contribution to the study [61].

3.5. Type of Research

In addition, research on these topics utilizes a wide array of references beyond research articles. These sources encompass a range of materials, including scientific and non-scientific content, such as online content, books, book chapters, reports, conference proceedings, data sets, and monographs. The inclusion of various types of research as references in the development of the article facilitates a deeper understanding of the relevance, comparison, and continuity of the research being conducted. Therefore, the use of diverse references strengthens the foundation and increases the validity of the article [62]. The image above shows a pie chart illustrating the proportion of study types or types of documents used in research related to road capacity in transportation systems of medium-sized cities. Citation analysis assesses the frequency with which others cite a work. A higher number of citations indicates greater scientific value and reflects the increasing societal demand for scientific research [63]. From this visualization, it is evident that the most dominant type of document is a journal article, accounting for 50% of the total**.** This indicates that most research on this topic is published in the form of scientific articles in accredited journals, reflecting the high interest among academics in the issue of road capacity as part of transportation studies.

The following fairly significant type of study is documented in HTML format, which accounts for 33% of the overall publications. HTML documents generally refer to articles that can be accessed directly through the web or online databases without the need for downloads in a specific document format. The high number of HTML documents shows that accessibility and information disclosure are important factors in the dissemination of scientific knowledge about local road capacity.

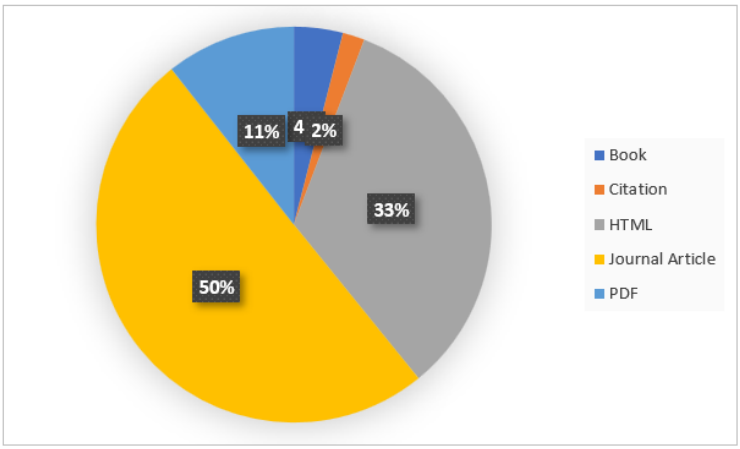

Figure 6 Study Type

Meanwhile, other types of documents include books at 11%, PDFs at 4%, and Citations at only 2%. The percentage of documents in the form of books shows that there are also contributions from more in-depth and comprehensive literature sources on this topic. While PDF documents with minor portions exhibit distribution limitations in this format, the existence of minimal citations suggests that citations without full access to sources are still rarely used in this study.

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Journal articles are the primary type of publication prevalent in unit hydrograph studies. Most studies on the unit hydrograph approach are usually presented as case study articles. [64]. Overall, the distribution of this type of document suggests that the scientific literature on road capacity in medium-sized cities is primarily composed of accessible journal articles in various formats, including both HTML and PDF, while contributions from books and citation sources remain relatively small. The diversity of document types underscores the importance of utilizing multiple sources in bibliometric research to gain a comprehensive and accurate understanding of the evolution of studies within the transportation field.

4. Conclusion

This bibliometric study provides a comprehensive evaluation of research advancements in transportation system capacity, with a particular focus on local roadway networks in medium-sized urban areas. The analysis reveals a notable increase in scholarly engagement over recent years, primarily driven by rapid urbanization, growing mobility demands, and the pursuit of sustainable transportation solutions. Utilising VOSviewer for data visualisation, the study effectively uncovers key thematic areas, patterns of academic collaboration, and trends in publication, thereby reinforcing the interdisciplinary essence of transportation research that integrates civil engineering, urban planning, and advanced technological innovation. The outcomes underscore the need for comprehensive research frameworks to address pressing issues such as traffic congestion, environmental degradation, and infrastructure constraints. The study advocates for future research to investigate forward-thinking approaches, including the deployment of intelligent transportation systems and data-informed methodologies, aimed at fostering urban transport systems that are more adaptive, sustainable, and resilient.

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