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Review

Sustainable Transport: A State-of-the-Art Literature Review

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Abstract: The transport sector plays an important role in society at large. This article aimed to provide a state-of-the-art literature review in the area of sustainable transport. Data for the analysis were collected from the Web of Science database from 2000 to 2022. A total of 1238 bibliometric records of publications were collected. Quantitative and qualitative analyses were undertaken in the article. The analysis results showed five main research areas: 1—sustainable urban/public transport and mobility; 2—transport emissions and fuels; 3—sustainable supply chain/logistics management models; 4—performance and metrics in sustainable transport; and 5—future and policy. The limitations of the research carried out, which mainly concern the methodological section, should also be borne in mind. These include the selected publication base and search criteria, such as the year or language of publication.

Keywords: cluster analysis; co-word; economies; environmental; literature review; trend

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1. Introduction

The transport sector plays an important role in society at large. On the one hand, its development has enabled social and economic benefits, while on the other, it causes negative social, economic and environmental impacts. Additionally, it is those negative impacts, such as congestion, air and water pollution, climate change, the depletion of non-renewable resources and many others that need to be reduced in the long term. To reduce these impacts, the concept of sustainable transport must be developed. Many studies have been carried out on this aspect but, to date, only a few attempts at their comprehensive review have been made.

Literature reviews play a fundamental role in research, as they support the advancement of knowledge by collecting, describing, analyzing and integrating large collections of information and data [1]. One of the commonly used types of literature reviews is the state-of-the-art (SotA) review based on bibliometric analysis. This methodology has been used in research in various areas of logistics. Georgi et al. [2] applied this methodology to analyze the fundamentals of logistics and supply chain management. Publications on urban logistics [3], reverse logistics [4] or supply chain management [5–7] can be found. Janic [8] reviewed research on the sustainability of transport systems. His analyses focused on documents introduced by the European Union. A similar review was carried out by Banister [9]. A review of barriers, strategies and innovative technologies in green transport was conducted by Shah et al. [10]. Therefore, an interesting issue is to conduct a literature review on sustainable transport using bibliometric methods and big data analysis. The most recent of these reviews is a paper by Zhao et al. [11], who analyzed the evaluation of sustainable transport studies from 2000 to 2019. They used quantitative scientometric analysis and qualitative discussion for the analysis. However, there has been a significant increase in the number of publications on sustainable transport since 2019. A review of the recent literature was therefore undertaken to identify the main trends.

The main objective of this article is to present the results of a bibliometric analysis of scientific research on sustainable transport, including in particular: identifying the dynamics of changes in the interests of researchers, identifying key researchers and research

units, identifying the main journals in the field of sustainable transport, identifying the main research areas using cluster analysis, and identifying directions for future research.

This article closes the research gap with regard to systematizing the recent literature and identifying links between research topics related to sustainable transport. Cluster analysis performed in the VOSviewer software was used to identify research areas. The next sections of the article are organized as follows: Section 2 is a brief literature review including a definition of sustainable transport. Section 3 describes the research methodology. Section 4 presents the results of the data broken down into five parts of the scientometric analysis. Section 5 discusses the research areas obtained from the results of the keyword analysis. Section 6 contains a summary that identifies the limitations of the research carried out and directions for future research.

2. Sustainable Transport Definition

The concept of sustainable transport has its roots in the definition of sustainability [12]. According to a widely accepted definition, sustainability is "development that meets the present needs without compromising the ability of the future generations to meet their needs". It, therefore, involves prioritizing specific needs while respecting the constraints of the environment to meet current and future societal needs [13,14]. From the perspective of economic practice, it makes sense to consider sustainability as an integrated order. This means combining environmental, spatial, economic, social and institutional order into a single entity [15].

Sustainable transport, or sustainable transportation, which is also often referred to as green transport due to its emphasis on environmental aspects, is stemmed from sustainable development. According to the Transportation Research Board [16], "sustainability is not about threat analysis; sustainability is about systems analysis. Specifically, it is about how environmental, economic, and social systems interact to their mutual advantage or disadvantage at various space-based scales of operation". Richardson [17] emphasizes that in a sustainable transport system, fuel consumption, vehicle emissions, congestion, safety and social and economic access should be maintained at a level that does not cause extensive or irreversible damage to future generations. The OECD [18], on the other hand, defines sustainable transport as transport that does not endanger public health or ecosystems. In addition, the reasonable use of renewable and non-renewable resources should be adhered to.

Sustainable transport is defined both in a narrow and broad sense. In the narrow sense, the authors focus only on the problems of resource depletion or air pollution. Additionally, even though this problem represents the most significant long-term environmental threat, it is incorrect to equate sustainable transport with environmental aspects alone. When sustainable transport is defined in a broad sense, social and economic well-being are additionally analyzed. Therefore, a broader definition is favored in research, as also highlighted by Litman and Burwell [19], which also encourages the search for integrated solutions in sustainable transport [20].

It is worth mentioning that sustainable transport should involve integrating environmental aspects with social and economic concerns, but also building an appropriate institutional setting for this. Meanwhile, related activities should be undertaken to ensure that the current, but also future needs of the population are met.

3. Materials and Methods

3.1. Research Methodology

This article aimed to provide a state-of-the-art literature review in the area of sustainable transport. The SotA procedure is described in detail by Barry et al. [21]. In this study, we used bibliometric methods to facilitate the analysis of a large number of publications [22]. Descriptive bibliometrics was used, with which it is possible to analyze trends in scientific research and also to identify relevant researchers or research centers [23].

The following tools and techniques were used in the bibliometric analysis: the analysis of changes in the number of publications, citation analysis and the co-word method. The analysis of changes in the number of publications and citations made it possible to identify trends and determine the level of knowledge transfer and dissemination by authors representing different research centers. Co-word analysis, in turn, identified the main thematic areas covered in sustainable transport publications. These areas were identified using the cluster analysis method developed by Zhu et al. [24]. Clustering was estimated in VOSviewer (Visualising Scientific Landscapes) software version 1.6.18 [25], a tool for the construction and visualization of bibliometric networks. The software allows work on large text files containing descriptions of bibliographic records from well-known databases, including Web of Science (WoS).

3.2. Data Collection and Research Tasks

Data for the analysis were collected from the Web of Science database on 2 September 2022. Web of Science is one of the main engines for searching scientific sources, offering a large variety of documents. In record retrieval, a fundamental issue is the identification of keywords that are believed to be relevant to the problem analyzed [26]. The analysis included articles with the following phrases in their titles: "sustainable transport", "sustainable transportation", "green transport" or "green transportation".

This resulted in a set of 3505 publications which were then subject to further selection. The following limiting criteria were applied:

(1) Date of publication—publications from 2000 to 2022 were included;
(2) Type of publication—publications in peer-reviewed scientific journals and books were included;
(3) Language of publication—publications in English were included;
(4) Publication topic—publications not focusing on the topic of sustainable transport as an area of logistics, e.g., those in health sciences, were eliminated.

After applying the limiting criteria, the dataset consisted of 1238 publications.

This was followed by a search for answers regarding the general trend in the number of publications and citations, the identification of the main researchers, centers, countries and journals, as well as the main research areas in the field of sustainable transport.

4. Results

4.1. General Trend in Sustainable Transport Publications

Figure 1 shows the number of publications in the WoS database for sustainable transport from 2000 to 2022. The constantly growing trend related to the interest in the analyzed topic should be noted. Three subperiods of sustainable transport publication development can be distinguished: (1) 2000–2009: low interest when a total of 120 publications appeared; (2) 2010–2017: medium interest, when an average of 56 articles were published per year (445 publications in total); and (3) 2018–2022: big interest, when an average of 135 articles were published per year (673 publications in total). The significant increase in the number of publications in recent years can be attributed to increased attention to the issue of sustainable development in environmental aspects, especially in reducing exhaust emissions by vehicles [27]. For example, many regulations concerning carbon dioxide emissions in transport are contained in many EU documents [28].

The growing interest in the topic of sustainable transport confirms the usefulness of systematizing the latest literature review and searching for future directions of research in this field. The largest number of publications corresponded to such research topics as green sustainable science technology, environmental studies, environmental sciences, transportation, transportation science technology, economics and energy fuels (Table 1). These areas were selected on the basis of the subject categorization scheme used by the Web of Science. In this database, all journals and books are assigned to at least one research area.

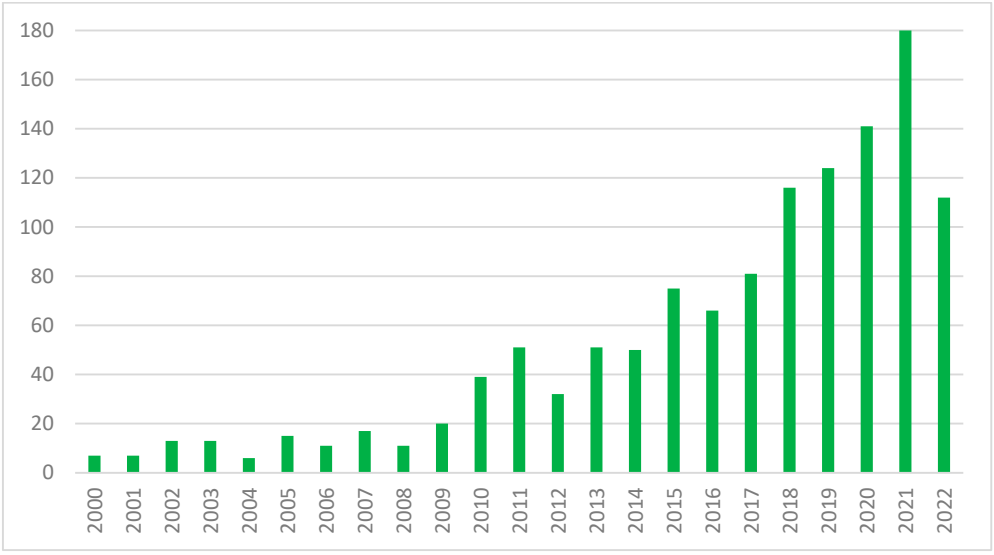

Figure 1. The number of publications related to sustainable transport in the period 2000–2022. Source: own elaboration based on the created database.

Table 1. Top ten research areas in sustainability transport.

Research Areas	Percentage of Papers
Green Sustainable Science Technology	29.9
Environmental Studies	27.7
Environmental Sciences	26.2
Transportation	23.2
Transportation Science Technology	13.6
Economics	9.9
Energy Fuels	8.9
Engineering Civil	8.2
Engineering Environmental	6.0
Operations Research Management Science	5.1

Source: own elaboration based on the created database.

4.2. Analysis of Authorship and Collaboration

In the next step, the distribution of authors' scientific productivity was analyzed. Several authors published five to seven papers on sustainable transport (only the author's participation in the publication was counted, not their position, such as first or correspondence) (Table 2). However, the vast majority of authors published only one paper in the analyzed period. The largest number of papers about sustainable transport was published by Buehler R., Li X.G. and Loo B.P.Y., and this was seven publications.

Based on the citations of publications, it is possible to assess the contribution of individual authors to the development of research on sustainable transport. From Table 3, it can be seen that in 2014, the review published by Dernir et al. [29] obtained the highest number of citations (398), followed by the article by Offer et al. [30] (305) from 2010 and Singh et al. [31] (276) from 2015. It should be noted that among the top ten publications cited are those on vehicles and new fuels as well as urban transport.

Table 2. Most productive authors by the number of papers.

Rank	Author	Number of Papers
1	Buehler R.	7
1	Li X.G.	7
1	Loo B.P.Y.	7
2	Macharis C.	6
2	Shankar R.	6
2	Wang S.R.	6
2	Zhang Q.	6
3	Gudmundsson H.	5
3	Holden E.	5
3	Kumar A.	5
3	Liu Y.	5
3	Nijkamp P.	5
3	Pucher J.	5
3	Roy S.K.	5
3	Sagaris L.	5

Source: own elaboration based on the created database.

Table 3. Top ten cited papers in sustainable transport literature.

Authors	Title	Total Citations
Dernir, E.; Bektas, T.; Laporte, G. [29]	A review of recent research on green road freight transportation	398
Offer, G.J.; Howey, D.; Contestabile, M.; Clague, R.; Brandon, N.P. [30]	Comparative analysis of battery electric, hydrogen fuel cell and hybrid vehicles in a future sustainable road transport system	305
Singh, S.; Jain, S.; Venkateswaran, P.S.; Tiwari, A.K.; Nouni, M.R.; Pandey, J.K.; Goel, S. [31]	Hydrogen: A sustainable fuel for future of the transport sector	276
Kenworthy, J.R. [32]	The eco-city: ten key transport and planning dimensions for sustainable city development	249
Bertolini, L.; le Clercq, F.; Kapoen, L. [33]	Sustainable accessibility: a conceptual framework to integrate transport and land use plan-making. Two test-applications in the Netherlands and a reflection on the way forward	246
Zhao, P.J. [34]	Sustainable urban expansion and transportation in a growing megacity: Consequences of urban sprawl for mobility on the urban fringe of Beijing	243
O'Brien, O.; Cheshire, J.; Batty, M. [35]	Mining bicycle sharing data for generating insights into sustainable transport systems	191
Pojani, D.; Stead, D. [36]	Sustainable Urban Transport in the Developing World: Beyond Megacities	186
Haghshenas, H.; Vaziri, M. [37]	Urban sustainable transportation indicators for global comparison	173
Alam, A.; Besselink, B.; Turri, V.; Martensson, J.; Johansson, K.H. [38]	Heavy-Duty Vehicle Platooning for Sustainable Freight Transportation. A cooperative method to enhance safety and efficiency	167

Source: own elaboration based on the created database.

4.3. Analysis of Publication Sources

Of the 1238 publications, 84% were published as articles in scientific journals, 6% as reviews and the remaining 10% as books and book chapters. Sustainability can be considered the leader in terms of the number of sustainable transport publications in the WoS database (Table 4). Popular journals in this field also include the Journal of Cleaner Production, the International Journal of Sustainable Transportation, Transport Policy, Transportation Research Part of Transport and Environment and Transportation

Research Record, in which nearly 15% of publications were published. Considering the publishing house, Elsevier is the undisputed leader (32% of publications).

Table 4. Scientific journals and publishers with the largest number of publications in sustainable transport.

Journal	Percentage of Papers
Sustainability	13.9
Journal of Cleaner Production	4.8
International Journal of Sustainable Transportation	3.0
Transport Policy	2.5
Transportation Research Part of Transport and Environment	2.3
Transportation Research Record	2.2
Energies	1.8
Sustainable Cities and Society	1.6
Transportation Research Part a Policy and Practice	1.4
Energy Policy	1.3
Renewable Sustainable Reviews	1.3
Transport Reviews	1.2
Research in Transportation Economics	1.1
Journal of Transport Geography	1.1
Journal of Urban Planning and Development	0.9
Publisher	**Percentage of papers**
Elsevier	31.9
MDPI	17.3
Taylor & Francis	10.1
Springer Nature	6.3
Sage	2.7

Source: own elaboration based on the created database.

When analyzing the total number of citations of articles, there were five journals with at least 1000 citations. Here, again, the leader is Sustainability (1915 citations), then Transport Policy (1455), Journal of Cleaner Production (1438), Energy Policy (1067), and Renewable & Sustainability Reviews (1039).

4.4. Analysis of Publications by Country and Research Center

Authors publishing sustainable transport papers most often come from China and the United States. In addition, many publications are affiliated with authors from countries such as England, India and Poland (Table 5). The authors from the countries mentioned were also the most open to international cooperation, apart from the Poles. However, it should be noted that China, India and the United States are the most populous countries. Therefore, their high position in the ranking seems justified. Thus, lower positions in the ranking are occupied by European Union countries characterized by a lower level of population.

In the next step, research centers were analyzed. It should be noted that the dispersion of research on the issue of sustainable transport is large. However, more publications in this field were published at the Indian Institute of Technology, the University of California, Beijing Jiaotong University and the Technical University of Denmark (Table 6).

Table 5. Number of publications by country.

Country	Percentage of Papers
China	17.4
USA	13.2
England	8.8
India	8.0
Poland	5.0
Australia	4.4
Germany	4.2
Italy	4.1
Sweden	3.8
Netherlands	3.4
South Korea	3.2
Canada	3.0
Taiwan	3.0
Denmark	2.5
Turkey	2.5

Source: own elaboration based on the created database.

Table 6. Number of publications by the research center.

Journal	Percentage of Papers
Indian Institute of Technology	2.3
University of California	1.5
Beijing Jiaotong University	1.2
Technical University of Denmark	1.2
University of Leeds	1.1
University of Oxford	1.1
Cardiff University	1.0
Chang a University	1.0
Hong Kong Polytechnic University	1.0
National Institute of Technology NIT	1.0
University of Hong Kong	1.0

Source: own elaboration based on the created database.

4.5. Analysis of the Main Research Areas

The co-word analysis that was used to perform cluster analysis was the next step, through which, areas of research in the field of sustainable transport were identified. It should be noted that co-word analysis, or co-occurrence analysis, is a technique by which the actual content of a publication can be examined [39]. This analysis uses words that are derived from keywords defined by the author(s). In addition, words that are found in the keywords, article title, abstract, index and even in the full text can also be analyzed [40]. As a result of this analysis, words that often appear together are thematically linked. This enables thematic clusters to be identified so that future directions for research areas can be determined.

The co-word analysis was carried out by following the steps below:

(1) Searching for records in the database using criteria that are described in detail in the methodology section.
(2) The export of data including author name(s), title, abstract, keywords and sources.
(3) The development of relationship maps forming thematic clusters.

A frequency analysis was carried out for a set of 5069 keywords, of which 147 phrases appeared a minimum of ten times.

(4) Analysis of the obtained results.

Figure 2 shows a visualization of the keywords for the topic area sustainable transport. The most frequent keywords were “sustainability” (129), “model” (122), “sustainable transport” (105), “mobility” (88), “impact” (80), “sustainable transportation” (74) “emissions”

(72), "public transport" (72), "policy" (66), "energy" (64) and "performance" (63). The number of occurrences is indicated in brackets.

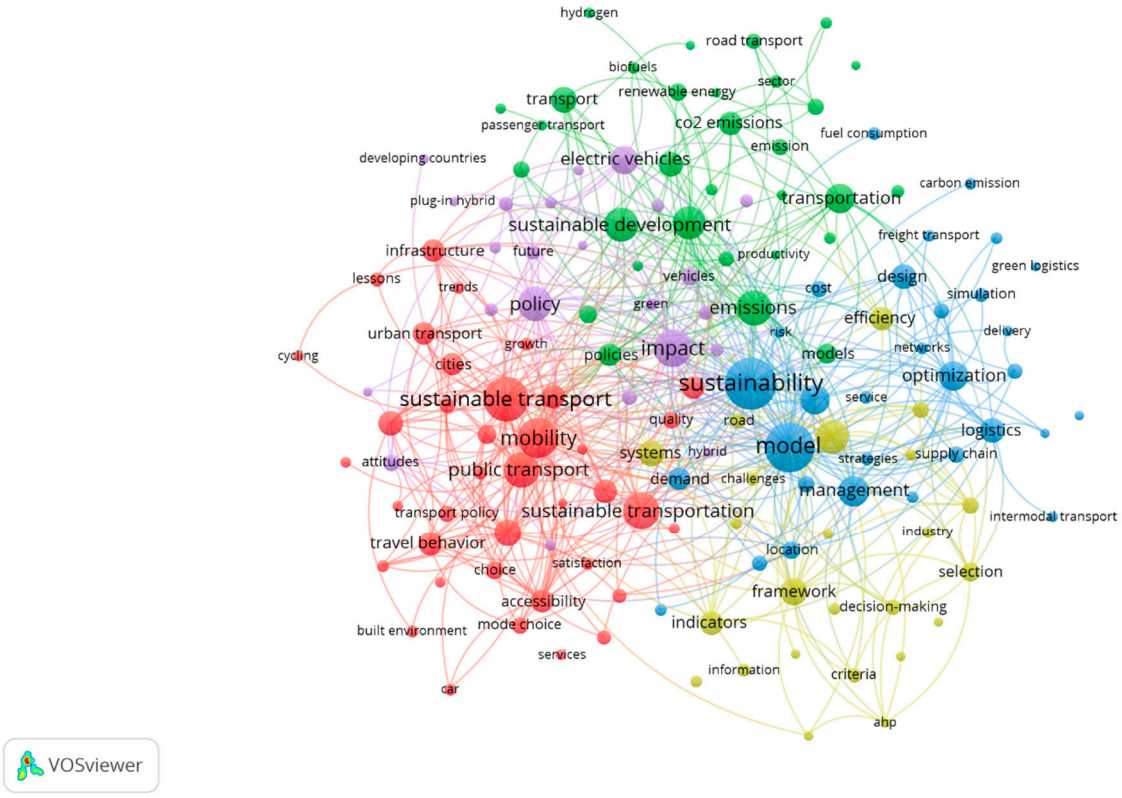

Figure 2. Co-Word cluster map. Source: own elaboration based on the created database.

Co-word analysis identified five research clusters related to the theme of sustainable transport: Cluster 1 (red)—sustainable urban/public transport and mobility; Cluster 2 (green)—transport emissions and fuels; Cluster 3 (blue)—sustainable supply chain/logistics management models; Cluster 4 (yellow)—performance and metrics in sustainable transport; and Cluster 5 (purple)—future and policy.

5. Discussion

5.1. Cluster 1—Sustainable Urban/Public Transport and Mobility

The first thematic cluster explored the topics of sustainable mobility, the issue of sustainable urban transport and eco-town design. Kennedy et al. [41] described four pillars of sustainable urban transport. They include (1) effective land use and transport management; (2) fair and efficient financing; (3) strategic investment in infrastructure; (4) attention to the design of surroundings. Kenworthy [32] points out that making cities greener and friendlier to live in is an urgent priority in the global drive for sustainable development. His work discusses the problems to be solved in this regard and then summarizes them in a conceptual model. The model emphasizes the relationship between transport and the urban form. He proposes the introduction of better public transport systems and conditions for non-motorized means, with some minimal increase in road capacity. Tuominen et al. [42], on the basis of their research, conclude that local authorities can use effective approaches to build capacity for the transformation towards active and sustainable transport. However, it is important to note that smaller towns often experience a different situation than very large cities in the introduction of sustainable transport aspects. This is reported by Pojani and Stead [36], among others, in their analysis of sustainable urban transport in smaller and medium-sized towns in developing countries. Haghshenas and Vaziri [37] used indicators to rank the world's cities in terms of sustainable urban

transport. In addition, there are case studies of the implementation of sustainable transport in other cities (e.g., [43–45]). Zhou [20] and Kraus and Proff [46], in turn, review the literature on this topic.

Public transport is often seen as one of the key elements in building sustainable cities. Miller et al. [47] carried out a critical review of the literature on the relationship between public transport and sustainability. While there are many studies on the use of fuels and new means of transport in public transportation, there are also studies in the area of mobility. Camps-Arago et al. [48] described the sustainable introduction of autonomous vehicles into public transport in Belgium, while Dalala et al. [49] presented the use of PV energy in powering electric buses. Mugion et al. [50], for example, investigated whether the quality of urban public transport services increases sustainable mobility. Sustainable mobility was also discussed by Croce et al. [51]. Meanwhile, Buehler and Pucher [52] described financially sustainable public transport.

Within this cluster, articles on bicycle transport were also popular. O'Brien et al. [35] conducted research on the mining of data on bike sharing to gain insights into sustainable transport systems. One of the publication trends is e-bikes, which have been discussed by, among others, Edge et al. [53] and Edge et al. [54], or bike-sharing [55,56].

5.2. Cluster 2—Pollutant Emissions and Fuels in Transport

This thematic area covers issues related to the environmental aspects of sustainable transport, including, among others, those related to transport emissions, energy consumption, renewable energy sources and new fuels in transport. In the case of the topic of emissions, publications undertake the problems of low-carbon emissions in transport [57,58], as well as the subject of air pollution caused by harmful compounds. Chavez-Baeza and Sheinbaum-Pardo [59], for example, presented scenarios for passenger road transport in the Mexico City Metropolitan Area in achieving lower emissions of air pollutants (CO, NOx, NM VOC (non-methane volatile organic compounds) and PM_{10} and GHG (greenhouse gases) (CH_4, N_2O and CO_2). Zahabi et al. [60], in turn, analyzed greenhouse gas emissions from urban transport. They explored the relationship of gases to the urban form, transit accessibility and emerging green technologies. In contrast, Loo et al. [61] analyzed carbon emissions from passenger transport. The aim of their article was to present the implications for the development of sustainable transport in China.

When it comes to the topic of energy consumption in transport, there is a vast body of research, particularly undertaken in recent years. Aziziankohan et al. [62] explored the topic of transport fleet management in a green supply chain. In their paper, they examined the impact of queuing theory on reducing vehicle waiting times, optimizing energy consumption and consequently reducing pollution. Jiang [63], on the other hand, analyzed the sustainable achievement of energy efficiency in transport based on the indicator analysis. In his research, he identified efficient and inefficient regions in terms of energy consumption in the transport sector. In their book, Chai et al. [64] analyzed energy consumption and pollution in China, comparing the situation in Japan and the USA and developing countries in terms of traffic demand and energy consumption in transport. The authors emphasize the urgent need for changes in China's transport policy that would enforce some form of breakthrough in energy saving and emission reduction.

Topics on renewable energy sources in transport are also of great interest. Shafiei et al. [65] use the example of Iceland to present a comparative analysis of hydrogen, electric, and biofuel transition pathways to future sustainable road transport. Garcia-Olivares et al. [66] analyzed the energy costs required to transform the EU's fossil-fuel-based transport system into a new one based on renewable energy sources. Kisielińska et al. [27] analyzed the use of renewable energy sources in road transport in European Union countries.

5.3. Cluster 3—Sustainable Supply Chain/Logistics Management Models

The third cluster included topics related to the issue of transport in a sustainable supply chain and logistics management models and their optimization. The ecodesign

of the transport system in sustainable supply chain management in both theoretical and practical terms has been the subject of papers published by, among others, Ji et al. [67]. Colicchia et al. [68] discuss intermodal transport issues in green supply chain management using consumer goods as an example. One of the most recent articles on this topic focuses on a sustainable supply chain after a disruption caused by the COVID-19 pandemic [69].

The optimization of a green transport system in the automotive chain was investigated by Syah et al. [70]. Xu et al. [71] used Bayesian Optimization to predict vehicle ownership toward a more sustainable society. Liu et al. [72], on the other hand, propose the use of an optimization model based on a genetic algorithm for the management of green operations by logistics service providers. It allows companies to adopt a favorable transport scheme and thus realize a low economic and environmental cost. One can also find studies on the introduction of: an integrated transport and land use design model [73], a multi-modal transport model for reducing carbon emissions [74] or an ecological urban transport model based on static spatial models [75].

5.4. Cluster 4—Performance and Indicators in Sustainable Transport

The fourth thematic area brings together publications on all types of indicators describing sustainable transport, with a particular focus on the popular study of the efficiency or performance of transport. One of the articles most cited in this area is the study by Black et al. [76], which describes the efficiency of sustainable urban transport. A paper by Rajak et al. [77], in which the authors address the problem of evaluating the efficiency of transport systems using logic, is also highly cited.

Research is also being conducted on energy efficiency in transport. Ćwil et al. [78] investigated it in rail transport, while Letnik et al. [79] looked at the energy efficiency of urban transport. There are also a number of studies on transport system indicators. Litman [80] focused on developing indicators for sustainable transport planning. This topic was also addressed by Castillo and Pitfield [81], who proposed the Evaluative and Logical Approach to Sustainable Transport Indicator Compilation (ELASTIC). Yang et al. [82], on the other hand, proposed 64 performance indicators (KPIs) to design sustainable and integrated transport infrastructure in urban spaces. Kjosevski et al. [83], in turn, using the AHP method, looked at the indicators for the introduction of electric passenger cars.

5.5. Cluster 5—Future and Policy

A separate cluster is represented by publications focusing on the future and policy of sustainable transport. For example, Eißel and Chu [84] described the future of the transport system in Europe. Hull [85] looked at integrating policies to introduce more sustainable transport in cities. Gossling and Cohen [86], on the other hand, addressed the fallibility of sustainable transport policy by drawing on an analysis of the EU climate policy.

Recent publications in this thematic area include, for example, analyses of sustainable transport and its impact on energy consumption and emissions in road transport [87]. Studies analyzing changes in mobility and transport policies in the post-COVID-19-pandemic period [88] or analyzing policies for sustainable transport systems and their impact on the quality of life of inhabitants [89] have also been conducted. Wong et al. [90] examined fiscal policy in the context of the development of green transport infrastructure. Meanwhile, Soto et al. [91] pointed out that sustainable transport policies should be formulated taking into account the diversity of the population in terms of preferences and attitudes.

6. Conclusions

The topic of sustainable transport is increasingly being addressed in academic papers, and the number of publications has increased remarkably since 2018. The spectrum of topics undertaken in studies is broad.

The conducted research allows the following conclusions to be formulated: First, the increasing number of publications on the topic of widely discussed sustainable transport shows that not only environmental but also economic and social aspects are gaining in

importance. Second, the most prolific authors in this field are Buehler, Li and Loo. At the same time, the most important research centers in the field of sustainable transport are the Indian Institute of Technology and the University of California. The study also reveals that China, the US and England dominate in terms of the number of publications. Meanwhile, the most popular journal in terms of the number of publications is *Sustainability*, while the most popular publisher is Elsevier.

The cluster analysis identified five clusters grouping the thematic areas of sustainable transport undertaken by authors. The first cluster comprises publications on mobility and sustainable transport in cities as well as public transport. The second cluster includes topics on environmental aspects of sustainable transport, such as emissions and fuels, among others. In the fourth cluster, a variety of sustainable transport efficiency indicators and assessments are brought together. Cluster five, on the other hand, includes topics on the future of sustainable transport and policy in this regard.

The limitations of the research carried out, which mainly concern the methodological section, should also be borne in mind. These include the selected publication base and search criteria, such as the year or language of publication. Therefore, research carried out on other databases, or even on the same one but using different criteria, may lead to different results. However, it should be noted that the results of this analysis do not diverge from the study by Zhao et al. [11], who identified nine thematic areas. However, the conducted research proves that the topics addressed in the publications cover increasingly broader aspects of sustainable transport and that these are interlinked, thus forming fewer clusters. Thus, a new trend can be distinguished in which in the latest scientific works, sustainable transport is analyzed not in a narrow but in a broader sense.

In addition, limitations include the co-word analysis itself, which also has some shortcomings. The word transport is quite a broad term and appears in a vast number of publications, but sometimes in quite unexpected contexts. Consequently, they can be assigned to several thematic clusters, which consequently blurs the picture of connections between words.

The bibliometric analysis carried out on sustainable transport is, to the best of the author's knowledge, one of a very small number of studies. Given the increasing number of publications, this type of analysis should be continued in the future to make it possible to identify changes in subject areas. It is to be expected that there will be increasing interest in publications based on the analysis of new technologies and the use of digitization in transport [92], new fuels [93] and developments in policy on sustainable transport systems.

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