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MOBILITY INDICATORS IN THE FUNCTION OF SUSTAINABLE MOBILITY

Keywords
Mobility
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Sustainable mobility
Sustainable development

Abstract
This paper aims to explore and show the importance of mobility indicators and their connection with sustainable mobility. Mobility indicators are and should be parameters that may ensure sustainable development and approach supporting practical terms of sustainable mobility. To research and review novelties in the field of mobility indicators numerous world literature has been researched. In this research, papers within the Scopus databases were used to gather information on the research topic which shows that a large number of authors have researched the area of sustainable mobility but there is insufficient correlation and connection between mobility indicators in the function of sustainable mobility. A search of Scopus using the following approach (TITLE-ABS-KEY ("mobility indicators") AND TITLE-ABS-KEY ("sustainable mobility") resulted in 49 scientific papers. From the aspect of sustainable development, it is essential to determine mobility indicators' reliability and relevance in the function of sustainable mobility.

1. INTRODUCTION

This paper aims to explore mobility indicators, and their connection with sustainable mobility, sustainable growth, and development. To research and review novelties in the field of mobility indicators, numerous world literature has been researched. In

this research, papers within the Scopus database were used to gather information on the research topic, thus showing that the field of mobility indicators has been researched by a sufficient number but not too many researchers, resulting in an insufficient connection between mobility indicators and its connection to sustainable mobility. To demonstrate the results of the research (and the scarcity of this research topic regarding the connection between mobility indicators and sustainable mobility), the results of a search of the Scopus database are presented, having led to 233 scientific papers dealing with mobility indicators, and 49 papers dealing with mobility indicators and its connection to sustainable mobility, with the observed period from 2002 – August 2023.

2. THEORETICAL FRAMEWORK

The concept of sustainable development is a key prerequisite for the growth and development of society as a whole. Sustainability has three essential areas: the environmental, the social, and the economic, and all of them are linked with transport. “The current European guidelines for the Sustainable Urban Mobility Plan (SUMP) promote a vertical (European, national, regional and local policy goals) and horizontal (sectorial and operational plans) integrated mobility planning approach based on the involvement of different target groups [1]. Managing transport activities adequately is critical in the pursuit of sustainable development [2]. “Sustainable mobility is an increasingly significant issue that both public and private organizations consider to reduce emissions by their members”[3]. A very important component of sustainable mobility are mobility indicators, while a lack of research in the field of mobility indicator is evident. An indicator is a general term used to define a parameter or to define a change within a process [4]. Silva et al. (2022) claim that a sustainable mobility system is a smart mobility "that is fully interconnected through the Internet of Things (IoT) and a seamless intermodal operation for passenger and goods transport “ [5]. Sustainable cities cannot survive without sustainable mobility [6].

3. FINDINGS

International researchers have dealt with and studied mobility indicators but a small number of them, and very few of them connect it with sustainable mobility. The focus and area of the research was the Scopus database to find data and studies that deal with mobility indicators and their connection to sustainable mobility. The first research results show results on mobility indicators, while the second step of the research presents results on mobility indicators and their connection to sustainable mobility. The first results are the results following the research approach TITLE-ABS-KEY ("mobility indicators") while the second step of the research presents results following the research approach (TITLE-ABS-KEY ("mobility indicators")) AND ("sustainable mobility"). The presented researched results are grouped into several areas according to (1) documents by type; (2) documents by subject area; (3) documents by year; (4) documents by country/territory; (5) documents by author. The first research results present an investigation of mobility indicators. This step

resulted in 233 papers (articles (171 (73,4%)), conference paper (41 (17.6%)) review (11 (4.7%)), book chapter (9 (3.9%)), and data paper (1 (0.4%)) (Figure 1).

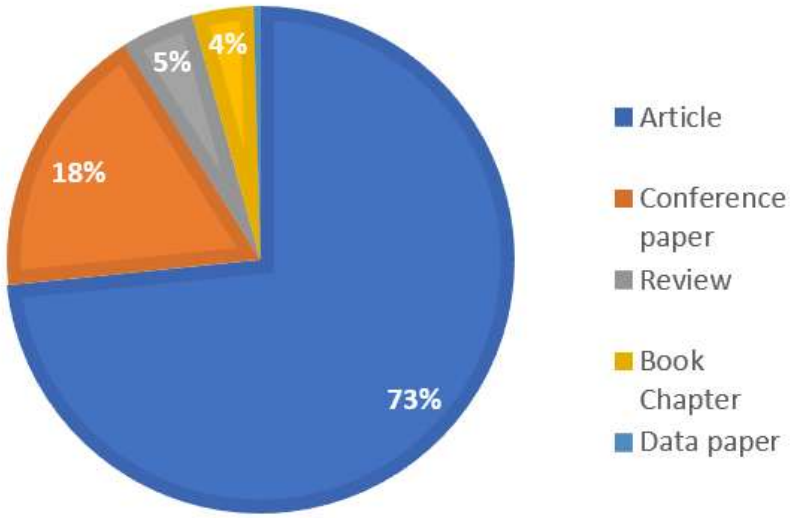

Figure 1. Documents by type investigating mobility indicators in the Scopus database (1973-April 2022) (Authors' work, 2022.)

The research area of the research topic presents the period from 1973 to August 2023 and includes various subject areas (Figure 2). Top three subject area are Social Science (21.2%), Engineering (12.4%) and Computer Science (11.6%).

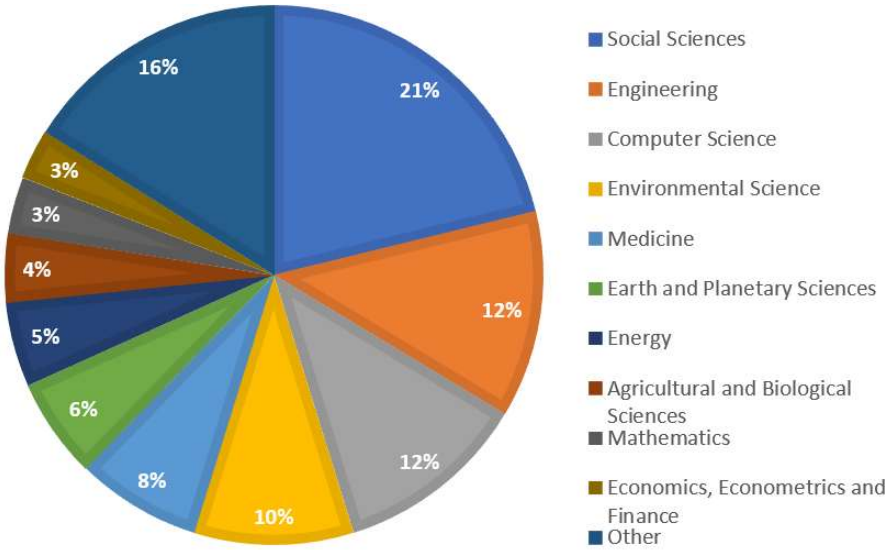

Figure 2. Documents by subject area investigating mobility indicators in the Scopus database (1973 - August 2023) Source: Authors' work, 2023.

The number of papers that investigate mobility indicators has increased in 2017 (17 papers). A growing trend is noticeable from 2015 (9 papers), 2016 (13 papers), 2017 (17 papers), 2018 (14 papers), 2019 (27 papers), 2020 (16 papers), 2021 (37 papers), 2022 (33 papers), and August 2023 (25 papers) (Figure 3).

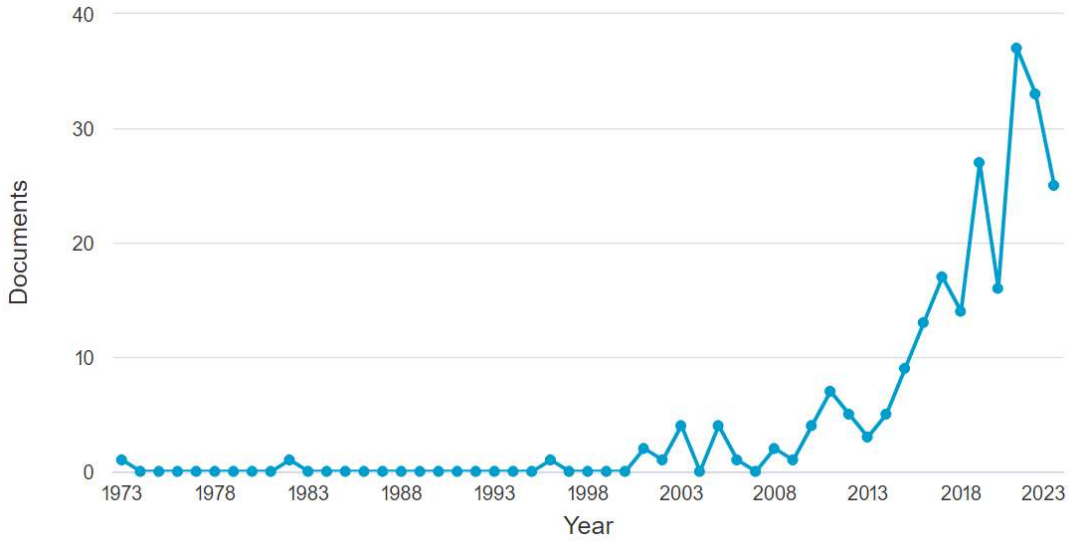

Figure 3. A number of papers investigating mobility indicators in the Scopus database (1973 – August 2023) (Authors' work, 2023.)

Top three of the research papers were from the United States (38 papers per country), China (23 papers per country), Spain (22 papers per country) (Figure 4).

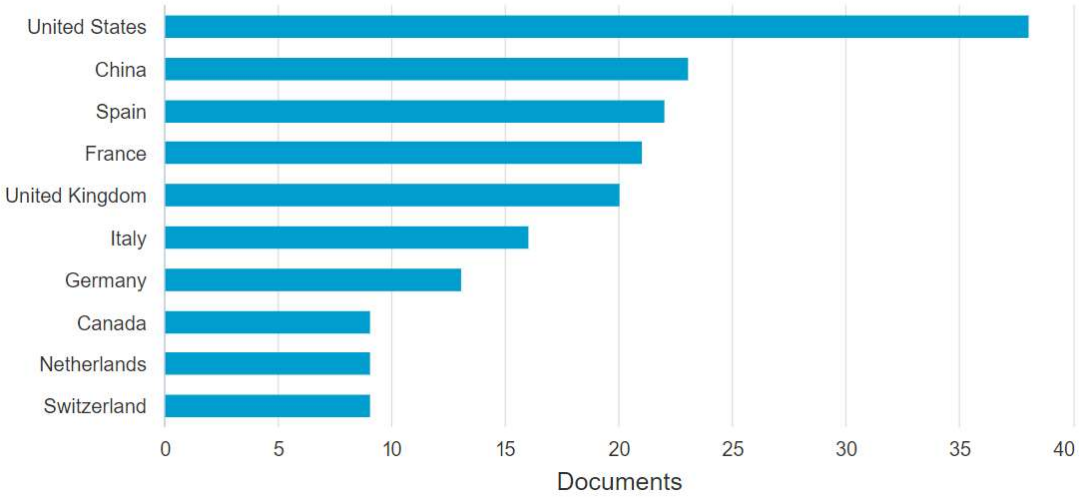

Figure 4. Country of origin of the authors investigating mobility indicators in the Scopus database (1973 - August 2023) (Authors' work, 2023)

Regarding authors who deal the most with the research topic, mobility indicators, are Shaw, S.L. and Xu, Y. (each author has 6 papers). Other authors have fewer than 4 papers that explore mobility indicators (Figure 5).

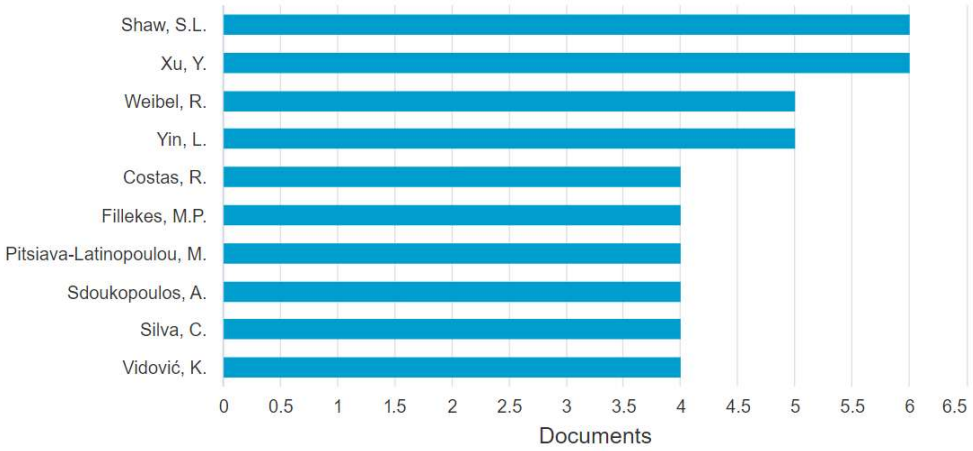

Figure 5. Documents by the author investigating mobility indicators in the Scopus database (1973 – August 2023) (Authors' work, 2023)

The second step of the research presents an investigation of mobility indicators and their connection to sustainable mobility. This step resulted in 49 papers (articles (24), reviews (18), Review (4), and Book Chapter (3). (Figure 6). The first paper that puts mobility indicators in relation to sustainable mobility was published in 2002, so the period of this research is from 2002 to August 2023.

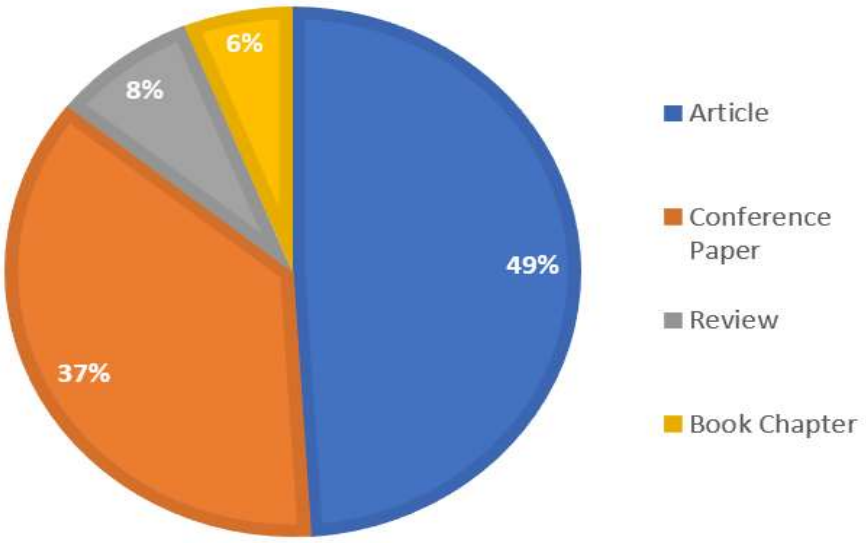

Figure 6. Documents by type investigating mobility indicators and their connection to sustainable mobility in the Scopus database (2002 – August 2023) (Authors' work, 2023)

Figure 7. presents the documents by subject area exploring the mobility indicators and their connection to sustainable mobility in the period from 2002 to August 2023 in the Scopus database. Top three areas are Social Sciences, Engineering and Environmental Sciences.

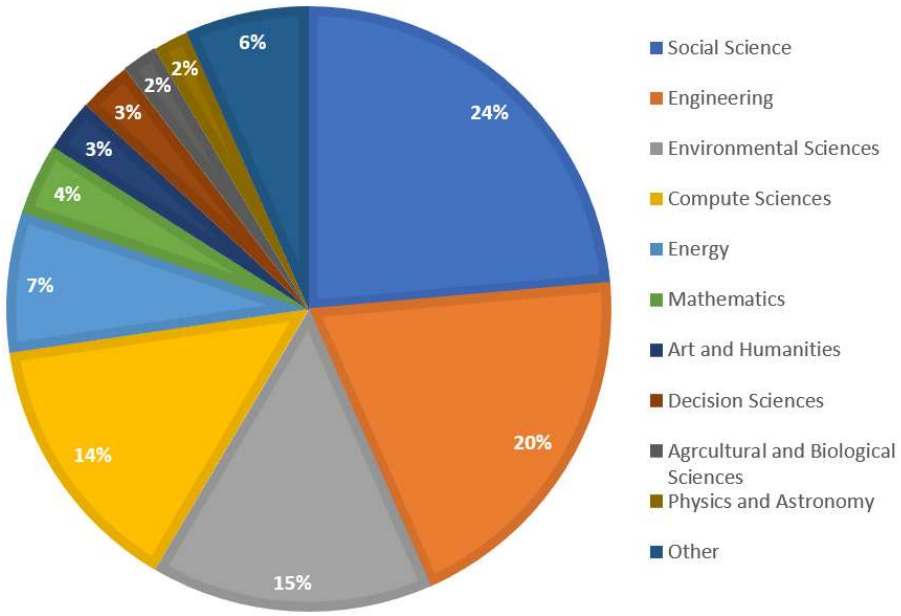

Figure 7. Documents by subject area exploring the mobility indicators and their connection to sustainable mobility in the Scopus database (1998-April 2022) (Authors' work, 2023.)

The number of papers that investigate mobility indicators and their connection to sustainable mobility has again increased in 2017 (9 papers). A growing trend is noticeable in 2019 (6 papers), 2020 and 2021 (5 papers), 2022, and August 2023 (6 papers) (Figure 8).

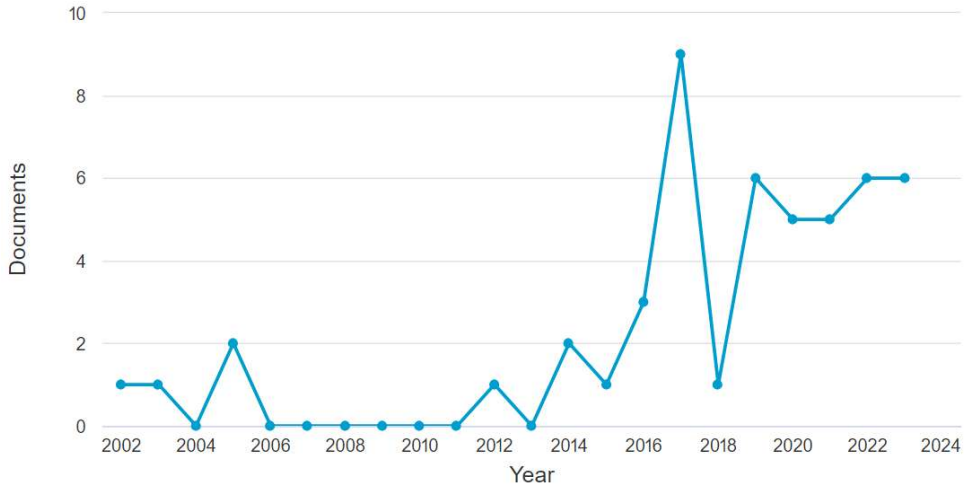

Figure 8. A number of papers investigating mobility indicators and their connection to sustainable mobility in the Scopus database (1998 -August 2023) (Authors' work, 2023.)

Most of the research papers were from Greece and Italy (6 papers per country), France (5 papers per country), Croatia and the United Kingdom (4 papers per country) (Figure 9).

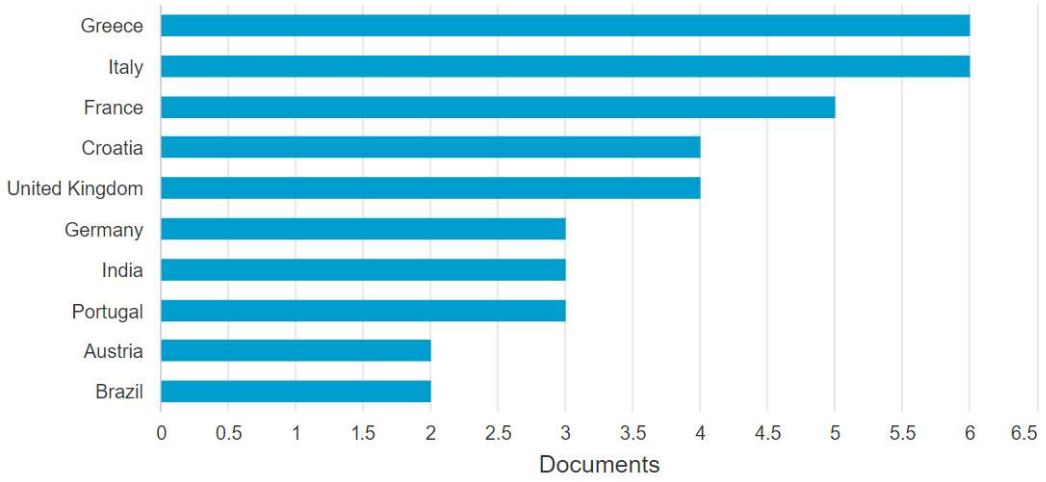

Figure 9. Country of origin of the authors investigating mobility indicators and their connection to sustainable mobility in the Scopus database (2002 -August 2023) (Authors' work, 2023.)

Authors who deal the most with the research topic and mobility indicators and their connection to sustainable mobility are Pitsiava-Latinopoulou, M. and Sdoukopoulos, A. (each author has 4 papers) (Figure 10).

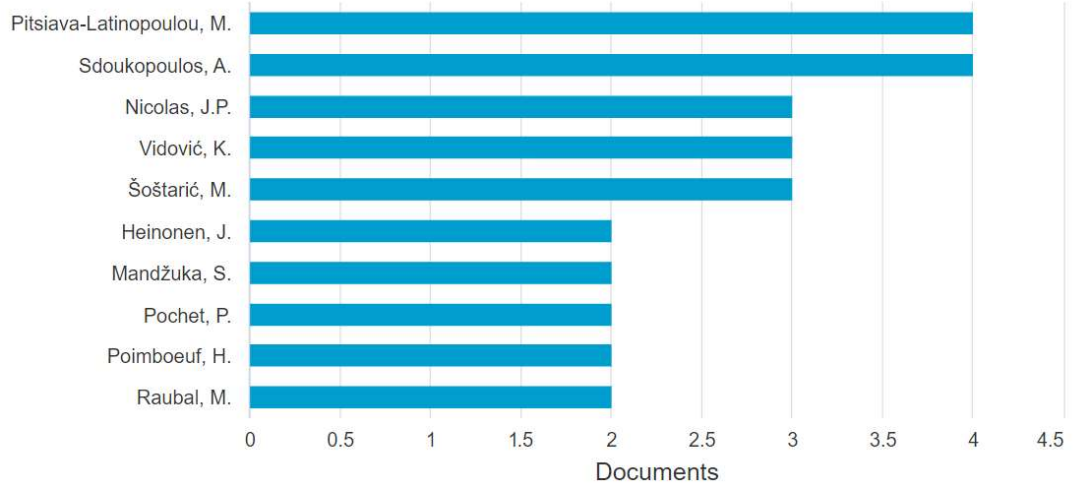

Figure 10. Documents by the authors investigating mobility indicators and their connection to sustainable mobility in the Scopus database (2002 –August 2023) (Authors' work, 2023.)

The presented research results are divided into two parts. The first part of the research presents data related to mobility indicators research, and the interest of researchers in this field in the period between 1973 and August 2023, when the first research covering this topic appeared. The second part of the research presents data that combines mobility indicators with sustainable mobility in the period from

2002 to August 2023, when the first document linked to this topic appeared. This research shows that researchers are engaged in exploring mobility indicators (233 papers, but still not enough researchers recognize and puts in connection the mobility indicators and sustainable mobility as shown by insufficient data and an insufficient focus in this area (only 49 papers through presented research).

4. CONCLUSION

This study was designed to survey articles on mobility indicators and its connection to sustainable mobility in peer-reviewed journals listed in the Scopus database. The research gains a total of 282 papers (233 of them regarding mobility indicators, and 49 of them regarding mobility indicators and their connection to sustainable mobility). This mapping considered a literature overview and had scope to review the current state and efforts of researchers in this area. The findings of this research indicate that the impact of mobility indicators in the function of sustainable mobility is an important and integral part but the area needs more empirical evidence, theoretical, and quantitative evidence, but also presents a baseline for future research.

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