

Sustainable decision-making in civil engineering, construction and building technology

Edmundas Kazimieras Zavadskas, Jurgita Antucheviciene, Tatjana Vilutiene and Hojjat Adeli

A pressing task facing the world today is sustainable development of cities and urban infrastructure addressed through constructive interaction of environmental, economic and social factors. Sustainability priorities encompass integrated problems that address environment protection, energy efficiency, optimized mobility, e-city technology and other fostering issues, including those appearing throughout all building life cycle, and deal with various levels of management and interest groups with different goals. From the mathematical point of view, this is multi-criteria group decision-making problems. In other words, the multi-criteria problems came from the multidimensionality paradigm conditioned by the ideology of sustainable development.

The paper of Edmundas Kazimieras Zavadskas, Jurgita Antucheviciene, Tatjana Vilutiene and Hojjat Adeli (2017) aims at filling the gap and summarizing publications related to developments and especially to applications of MCDM methods, including those for supporting overall sustainability in construction and civil engineering and for promoting their usage in modern decision-making. Because of the MCDM ability of to join different techniques MCDM approaches can assist decision-makers in handling miscellaneous information, involving stakeholders' preferences, interconnected or contradicting criteria, and uncertain environments.

This paper comprehensively reviews the literature related to MCDM methods applied in civil engineering, construction and building technology areas in past three years (2015-2017) on the basis of papers referred in Thomson Reuters Web of Science academic database. The domains analyzed in paper presented in figure 1.

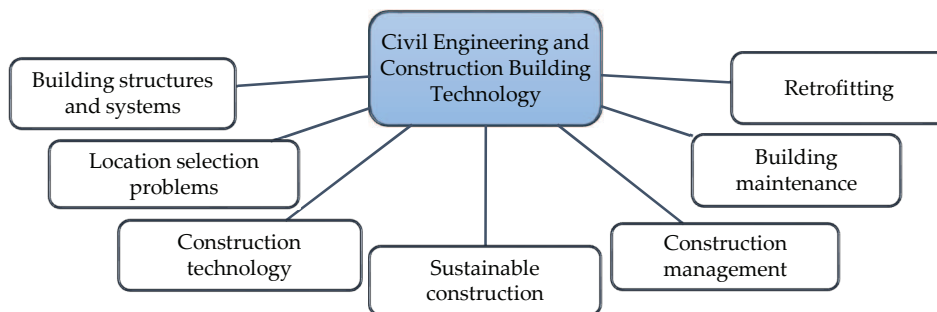


Fig. 1. The domains analyzed.

The research presents the results of analysis and answers the following questions:

- (1) How are applications of MCDM methods distributed by a period of publishing, by a country, by institution, and by research domain?*
- (2) Which MCDM methods are used the most frequently in analyzed research domains?*
- (3) How MCDM methods were combined and which of them were the most popular?*

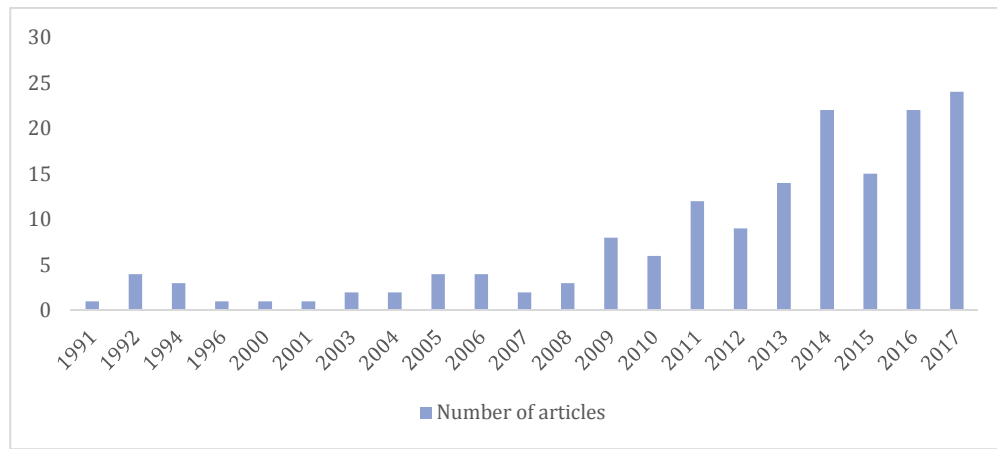


Fig. 2. Number of publications on the topic “MCDM” in Civil Engineering and Construction Building Technology Web of Science Categories (Web of Science Core Collection database, 15 October 2017).

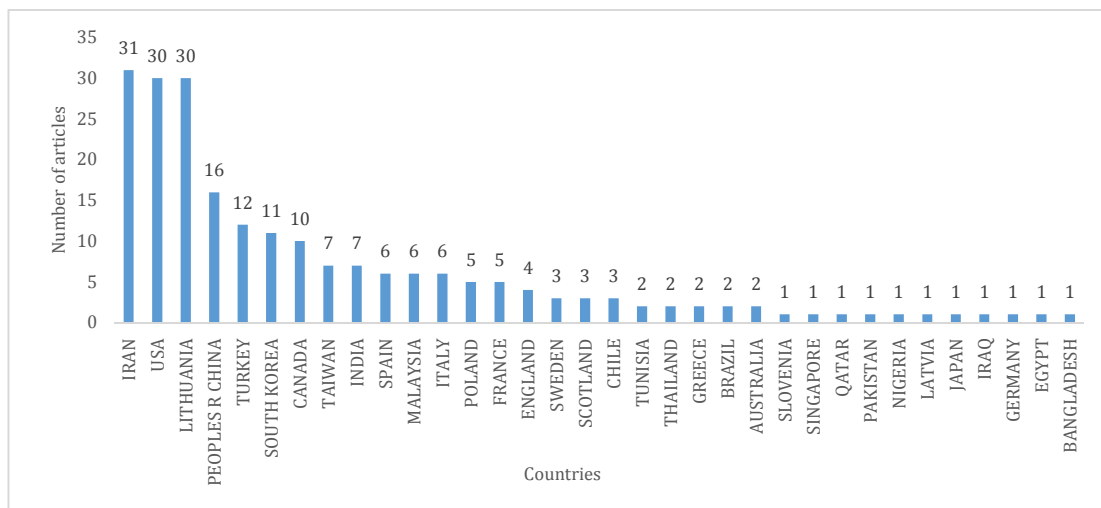


Fig. 3. Publications by country on the topic of “MCDM” in Civil Engineering and Construction Building Technology Web of Science Categories (Web of Science Core Collection database, 15 October 2017)

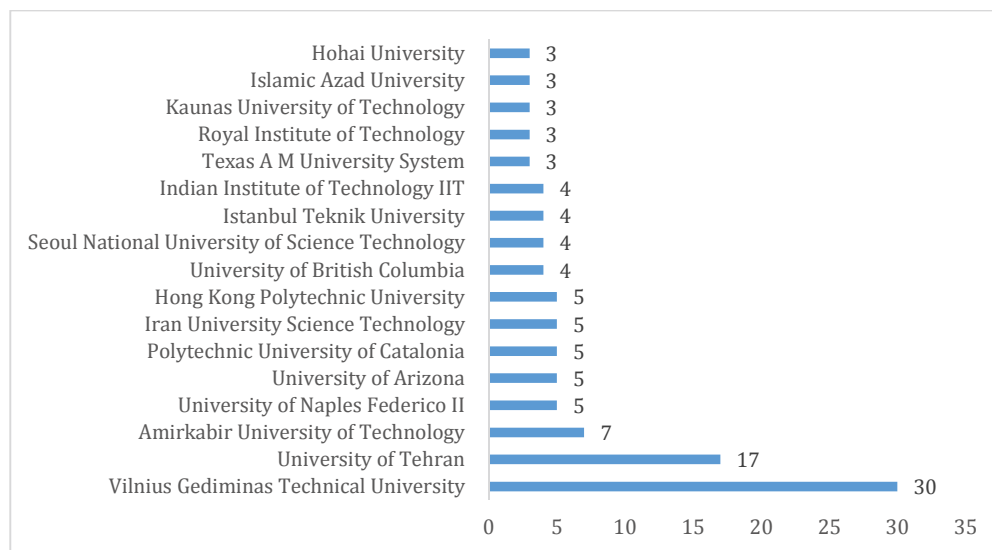


Fig. 4. Publications by institutions on the topic “MCDM” in Civil Engineering and Construction Building Technology Web of Science Categories (Web of Science Core Collection, 15 October 2017).

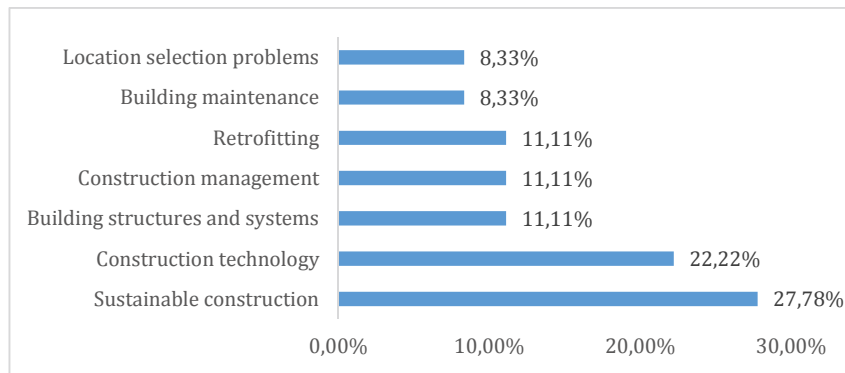


Fig. 5. MCDM applications in domains of Civil Engineering and Construction Building Technology research areas (Web of Science Core Collection, 15 October 2017).

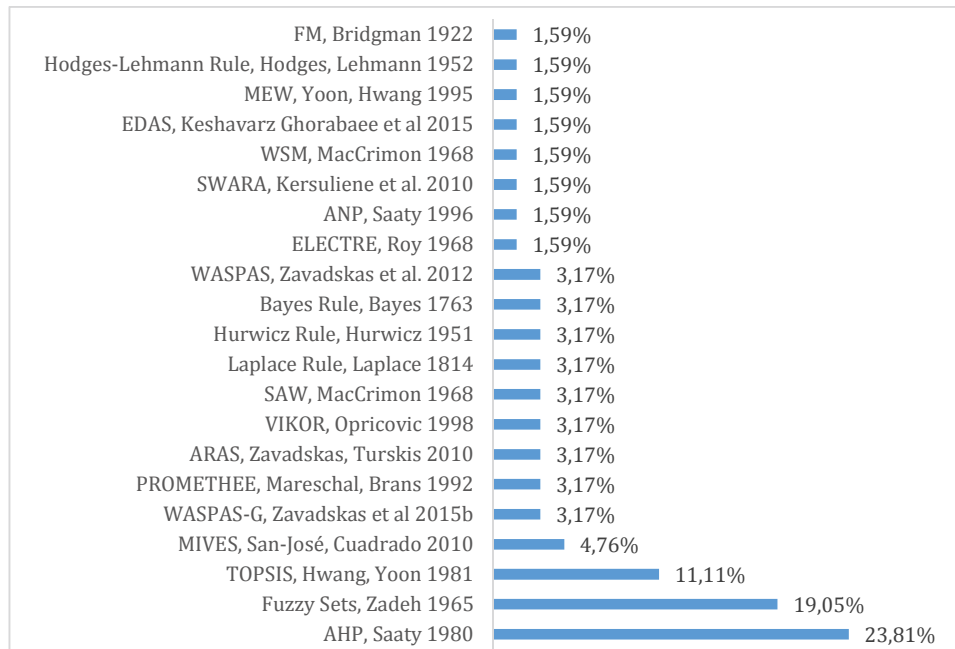


Fig. 6. Methods applied in articles on Civil Engineering and Construction Building Technology (Web of Science Core Collection, 15 October 2017).

In summary, the use of MCDM methods reached out to various subareas of civil engineering and construction/building technology, proving that researchers in many fields are becoming increasingly aware of the importance of considering multiple aspects of reality when it comes to sustainable decision-making in civil engineering and construction/building technology. This review is also of political relevance because it shows that sustainability is a complex, manifold task, which urges political decision-makers to consider aspects that go beyond financials and implement solutions that make a balance between cost and benefits to all stakeholders.

In addition, the findings of the current research confirm that applications of MCDM approaches for sustainability issues are gaining a higher recognition due to their ability to effectively assist decision-makers in handling complex information.

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