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Review

A scientometric review of global research on sustainability and sustainable development

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ABSTRACT

The concept of sustainable development has gained worldwide attention in recent years which had enhanced its implementation. However, few studies have attempted to map the global research of sustainability. This study utilizes scientometric review of global trend and structure of sustainability research in 1991–2016 using techniques such as co-author, co-word, co-citation, clusters, and geospatial analyses. A total of 2094 bibliographic records from the Web of Science database were analyzed to generate the study's research power networks and geospatial map. The findings reveal an evolution of the research field from the definition of its concepts in the Brundtland Commission report to the recent development of models and sustainability indicators. The most significant contributions in sustainability research have originated primarily from the United States, China, United Kingdom and Canada. Also, existing studies in sustainability research focus mainly on subject categories of environmental sciences, green & sustainable science technology, civil engineering, and construction & building technology. Emerging trends in sustainability research were sustainable urban development, sustainability indicators, water management, environmental assessment, public policy, etc.; while the study generated 21 co-citation clusters. This study provides its readers with an extensive understanding of the salient research themes, trends and pattern of sustainability research worldwide.

Contents

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1. Introduction

The fulcrum for the worldwide attention being paid to the concept of sustainable development (SD) was the Brundtland Commission report of 1987 which help defined SD as seeking "to meet the needs and aspirations of the present without compromising the ability to meet those of the future" (WCED, 1987). However, there have been challenges in meeting some of the thresholds of SD due to the limitation imposed by the social issues, technological advancement and the ability of the ecosystem to accommodate human carbon footprints. Therefore, it is unrealistic to have a single SD blueprint for every country or region. Hence, each country would need to develop its SD policies and standards but with a global objective in mind.

As noted by Axelsson et al. (2011), sustainability and SD are two concepts that have gained reception at national and global levels due to challenges and risks faced in areas such as rural development, environmental conservation, energy, climate change, human wellbeing etc. Hence, in recent years there have been a shift in focus and action plans to address these problems. SD is currently adopted as a growth strategy in the built environment. According to Sartori et al. (2014), sustainability is described as a process and mechanism to achieve the intended sustainable development; while according to Dovers and Handmer (1992), it is a process of "intentional change and improvement,".

As noted by Norton (2005), the two terms of sustainability and SD are often used interchangeably, however, Axelsson et al. (2011) argued that the two concepts are quite different. Axelsson et al. (2011) described sustainability as a policy vision of the society with primary purpose of preventing the depletion of natural resources. Clark (2002) however, observed that the issue of what sustainability means is more complex and per Parrotta et al. (2006) and Ramakrishnan (2001), it currently involves issues such as biodiversity conservation, ecological integrity etc.

In contrast, as stated by Axelsson et al. (2011), SD is more of a collective societal process that involves multiple stakeholders with differing salience level and powers. Nevertheless, Lee (1993) described both concepts as a "social learning and steering process" which involved both management and governance mechanism. The concept of sustainability is conceptual (Ekins et al., 2003) and hence easily misunderstood, although still hugely popular (Slimane, 2012). SD is however multidimensional in scope (Slimane, 2012), an integrated concept (Sartori et al., 2014) and based on the principles of sustainability (Dovers and Handmer, 1992). SD also helps to find a balance between preserving the ecosystem and meeting human needs. The three pillars of SD are environmental, social and economic sustainability; and these constructs must be harmonized to achieve a holistic SD.

Environmental sustainability is concerned with confining human activity within the carrying capacity of the ecosystem (such as materials, energy, land, and water, etc.) prevailing in the locality and places emphasis on the quality of human life (air quality, human health). Moreover, the economic sustainability considers the efficient use of resources to enhance operational profit and maximize market value. It also deals with substituting natural for manmade resources, reuse, and recycling. However, the social sustainability focuses on the social well-being of the populace, balancing the need of an individual with the need for the group (equity), public awareness and cohesion, and participation and utilization of local labors and firms. Sartori et al. (2014) acknowledged that the approach to sustainability defers based on the field of application, such as engineering, management, ecology, etc. Sala et al. (2015) considered sustainability assessment as an appraisal method to evaluate the level of the implementation of these sustainability measures. The sustainability assessment results will be used for decision-making and policy formulation for real-world SD applications (Hacking and Guthrie, 2008).

Several studies have been published to addressed salient challenges facing sustainability in the built environment. Ahmad and Thaheem (2017) developed a social sustainability assessment framework for residential buildings using a weighted aggregation approach to improve its performance value. Also, Ahmadian et al. (2017) and Akanmu et al. (2015) utilized a Building Information Modelling (BIM)-based approach to address sustainability issues regarding material selection and supply decisions. Moreover, Damtoft et al. (2008) discussed issues relating to climate change initiatives and SD. Meanwhile, studies (see Akinade et al., 2015; Althobaiti, 2009; Forsberg and von Malmborg, 2004; Gao et al., 2015; Huang et al., 2010; Wang et al., 2015); attempted to integrate technological and innovative tools to advance the concept of sustainability and SD.

1.1. Knowledge gap, research objectives, and value

Sustainability is a wide and complex research field which several applications in different disciplines and industries. However, previous review papers on sustainability in the built environment have focused mainly on environmental sustainability, a gap which the current study tends to bridge. For instance, Wong and Zhou (2015) examined the concept of green BIM and sustainability across the various stages of building development. The authors examined the research frontiers of green BIM and proposed a 'one-stop-shop' BIM for environmental sustainability. Also, Darko et al. (2017) classified the drivers of green building and categorize them into five (5) sub-levels such as external drivers, property-level drivers, corporate-level drivers, project-level drivers, and individual-level drivers. Both Wong and Zhou (2015) and Darko et al. (2017) used the Scopus database.

Similarly, Falkenbach et al. (2010) reviewed the drivers for sustainable building by examining the perspective of various stakeholders in the real estate market. Aarseth et al. (2016) carried out a systematic literature review (SLR) and highlighted several project sustainability strategies that could be employed in project organizations to enhance project performance. Lele (1991) carried out a critical review of the concept of SD and discusses the idea in relation to issues such as economic growth, environmental degradation, community participation, and international grade. However, the review didn't include discussions of extant literature as