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Green corridor: A critical perspective and development of research agenda

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The rapid development of industrialization, transportation, and urbanization has a negative impact on nature such as increased pollution, decreased pervious surface area, and increased temperatures. Researchers are consistently trying to find out ways that can facilitate the reduction of naturally unfriendly impacts. In this context, “green corridors” play a critical role. The main goal of the “green corridors” is to help build sustainable industrial, urban, and transportation networks by meeting requirements for environmental, technical, economic, social, and space planning issues. This paper provides a critical perspective on extant “green corridor” research by analyzing its performance and unwinding the intellectual structure. The perspective also sheds light on gaps in current literature and, therefore, possible future research avenues and calls for research in the field of “green corridor.”

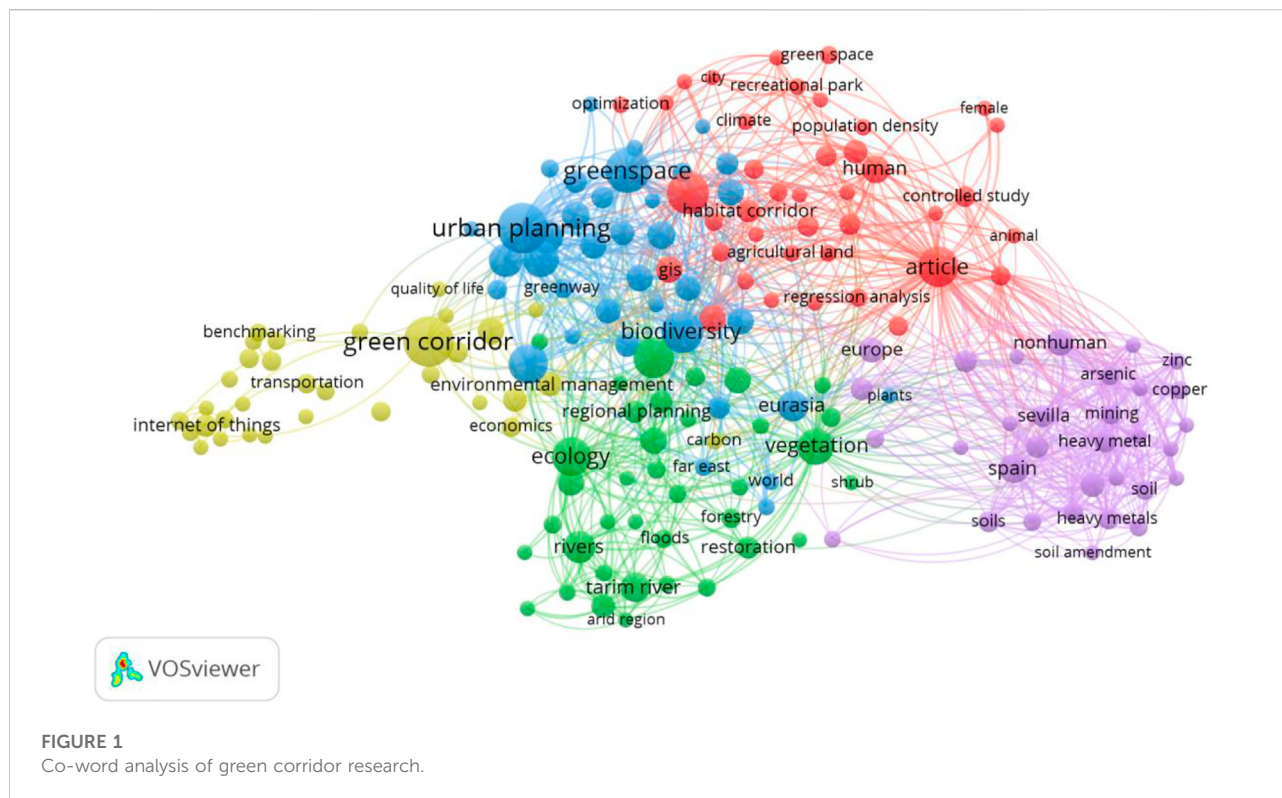
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Introduction

Urban ecosystem

The rapid development of industrialization, transportation, and urbanization in recent decades had a negative impact on nature (Zhang et al., 2019). Previous scholarship has reported that industrialization is playing the role of magnets in the increasing trend of people in urbanizations, where more resources, technology, major job opportunities, and facilities are available (Morya and Punia, 2022). This urbanization is the largest consumer of natural resources and producer of waste and pollution, which harm nature. Given the importance to nature, recent research specifies that urbanization has a negative impact on plant reproductive attainment as a result of altered habitat fragmentation and/or pollinator availability. It is widely acknowledged that enhancing ecological conditions for urban pollinators will likely increase reproductive success in insect-pollinated plants and facilitate interactions between urban plants and pollinators (Zhang et al., 2019). Moreover, El Adli and Abd El Aziz (2022) found that urban ecosystems experience numerous abiotic ecological changes, such as augmented pollution,



decreased open surface area, and increased temperatures. These changes have negative impacts on nature. In this vein, green corridors are becoming increasingly important in nature protection.

Conceptual background of green corridors

The idea of green corridors came from Olmsted's "Parkways" in the United States and Ebenezer Howard's "Garden City" in England in the early 20th century. The goal of green corridors is to keep open spaces in cities and make sure they are connected. [Aly and Amer \(2010\)](#) defined "Green Corridor is networks of linked landscape elements that provide cultural, recreational, and ecological benefits to the community." Green corridors are linear open spaces, such as farmland, parks, or natural or seminatural areas, interwoven within or outside of urban areas to protect the environment and landscape ([McMahon and Benedict, 2000](#); [Ibrahim et al., 2022](#)). People all over the world agree that green corridor systems are good for recreation, wildlife, and the environment and that they can bring many benefits to people who live in industrial and urban areas. The activities of green corridors provide transferable solutions to environmental, social, economic, and quality of life issues throughout the world.

The green corridors create a Green Network, which helps people relink with nature and provides instant and societal welfare ([Che-Ani et al., 2012](#); [Plantation and Pasoh, 2014](#)). Green corridors are beneficial to the quality of life because they bring elements of nature into the urban environment and stimulate the senses through the use of sound, color, motion, and smell in relatively positive ways ([Moreno et al., 2020](#)). Instead, the primary purpose of each natural environment corridor is to facilitate environmentally friendly modes of transportation. Sustainable transportation systems can benefit from a dynamic greenway network. As a result, it serves as a conduit for the movement of people and things. In light of these benefits, green corridors are a subtle reply to global environmental sustainability.

There is evidence of evolving research in this context, however, when it comes to the unwinding of the intellectual structure of the research and providing future research avenues, studies are sparse. Some researchers have conducted a systematic review to identify possible research gaps but our study provides a perspective based on the panoramic view of the green corridor research in the past 30 years.

As concerns over sustainability are well recognized and encouraged by UNDP. From the perspective of green corridor sustainability, however, global development agencies are not playing an adequate role. The purpose of this perspective is to highlight that green corridor sustainability is not an automatic

TABLE 1 Most prolific stakeholders of green corridor research.

Factor	Particular	Numbers
Publications by country	China	77
	Spain	44
	India	32
	United Kingdom	22
	United States of America	22
	France	17
	Italy	17
	Brazil	16
	Germany	14
	Canada	12
Publications by affiliations	Chinese Academy of Sciences	24
	Xinjiang Institute of Ecology and Geography Chinese Academy of Sciences	14
	Consejo Superior de Investigaciones Científicas	9
	Universidad de Granada	9
	CSIC - Instituto de Recursos Naturales y Agrobiología de Sevilla IRNAS	8
	Technical University of Denmark	8
	University of Chinese Academy of Sciences	7
	Tallinna Tehnikaülikool	7
	Universidade de São Paulo	6
	Peking University	6
Publications by funding sponsor	National Natural Science Foundation of China	22
	European Commission	11
	Chinese Academy of Sciences	7
	Conselho Nacional de Desenvolvimento Científico e Tecnológico	5
	Seventh Framework Programme	5
	Coordenação de Aperfeiçoamento de Pessoal de Nível Superior	4
	Junta de Andalucía	4
	Ministerio de Ciencia e Innovación	4
	Agence Nationale de la Recherche	3
	European Regional Development Fund	3
Publications by subject area	Environmental Science	162
	Social Sciences	119
	Engineering	94
	Agricultural and Biological Sciences	90
	Computer Science	59
	Earth and Planetary Sciences	55
	Energy	29
	Business, Management, and Accounting	24
	Decision Sciences	15
	Materials Science	15
	Mathematics	13
	Economics, Econometrics, and Finance	12
	Medicine	11
	Multidisciplinary	10
	Physics and Astronomy	10
	Chemical Engineering	7
	Arts and Humanities	6
	Biochemistry, Genetics, and Molecular Biology	6

(Continued on following page)

TABLE 1 (Continued) Most prolific stakeholders of green corridor research.

Factor	Particular	Numbers
	Pharmacology, Toxicology, and Pharmaceutics	6
	Chemistry	5
	Immunology and Microbiology	2
	Health Professions	1
	Nursing	1
	Psychology	1

by-product of development projects; therefore, global development agencies must give it serious consideration.

Technique for analyzing green corridor research

A bibliometric technique is applied in the current study to conduct a review of green corridor research. The present study analyzes the performance and intellectual structure of the existing literature on green corridor that has been published in journals that are indexed in Scopus. In particular, journals that are indexed in Scopus must meet a stringent set of criteria in order to be indexed in Scopus. Scopus is a comprehensive database that contains a large number of journals (Paul et al., 2021). The phrase “green corridor” is used to search as the keyword throughout this research, which allows the bibliometric information and full texts of journal articles to be retrieved from Scopus (a database that serves as both a search mechanism and an acquisition tool), during the period of time up to June 2022.

Following the completion of the search, a total of 406 documents were found. The research relied on the “filtered results” codes (filters) that were given out by Scopus in order to arrange the documents that were returned as a result of the search. This helped the researchers organize and refine the articles. In particular, the codes perform the function of document characteristics that were utilized for the purpose of document purification (or filtering). Publications were either included or omitted from the analysis based on the codes. To be more specific, the review is comprised of “English” (language) “articles” (document types) that were published in “journals” (source type) in subject areas that were thought to be pertinent to green corridor. More importantly, the criteria that were utilized to arrange and purify the search results are similar to the suggestions that were made by Donthu et al. (2021), as well as those made by Paul et al. (2021). After the results of the search were sorted and cleaned up, a total of 406 documents were found to have been returned.

In particular, this perspective is based on the performance analysis that was conducted in order to determine the metrics that characterize the publication and citation patterns, as well as

the authors, journals, and documents that are the most prolific in the field of green corridor research. This study also does scientific mapping in the form of bibliographic coupling, which groups documents based on similarities in shared references (Boyack and Klavans, 2010), and co-word analysis, which groups documents based on the co-occurrence of keywords. Both of these methods are described in the following paragraphs (Donthu et al., 2021).

The performance and intellectual structure of green corridor research

The first article with the title “Green corridors: a discussion of a planning idea” in the Scopus database dates back to 1990. From that point forward until June 2022, a total of 406 publications were added to Scopus. Of the total papers, 283 were cited, suggesting that 47.16% of the papers had references. These papers got a total of 4853 citations, for an average of 11.95 citations per document, which is lower than equivalent emerging concepts in the social sciences and management. The papers comprised journal articles, book chapters, conference proceedings, and reviews. There were a total of two review articles, whereas the rest investigations were empirical. Although the first article on green corridors was published in 1990, even though the research interest did not grow until 2000 (7 out of 406 papers), no article was published in 1998. In 2006, a total of 11 articles on green corridors are published, followed by 28 in 2015. By considering the trend of publication, 46 articles are published in 2020, whereas 40 documents were published in 2021. Considering the publication trend, 46 articles were published in 2020, whereas 40 were published in 2021. Only 15 papers were published between January and May of 2022, indicating that the field is on track to match or exceed its output from the previous year. However, the potential of having a big impact in the near future should not be ignored; thus, future research on green corridors should try to provide the field with fresh and creative ideas that might considerably improve its theory and practice immediately. Overall, it is evident that academics and publishers have not paid much attention to the issue of green

corridors, particularly over the past decade while the number of yearly publications has expanded.

Next, we carry out the co-word analysis via VOSviewer. Figure 1 displays that there was a total of 3356 keywords, but from these only 179 met the criteria, which resulted in six primary clusters. The minimum number of occurrences required was five.

According to the co-word analysis, *Cluster 1 (the red cluster)* has been considered the most significant one; it contains a total of 40 keywords and is referred to as agricultural land and ecology. Agricultural land, animal, anthropogenic influence, conservation management, conservation of nature, management of ecosystems, and management of the environment are the primary terms that fall under this cluster. *Cluster 2 (the green cluster)* is the second-largest cluster after Cluster 1. It has a total of 37 keywords, each of which appears a minimum of five times, and it is known as the climate change and water conservation cluster. The main keywords in this cluster are climate change, disaster, environmental impact, flood, forestry, groundwater, vegetation, water conservation, water supply, and watershed.

Cluster 3 (the blue cluster) also consists of 37 keywords and is the term urban design and land use. In general, the keywords included are biodiversity, connectivity, conservation planning, eastern hemisphere, land use, urban design, and urbanization. *Cluster 4 (the yellow cluster)* is with 33 qualified keywords as per set criteria. This cluster is termed green corridor and transportation and consists of main keywords such as ambulance, benchmarking, carbon, emergency vehicles, freight transport, green transport, motor transportation, planning, transportation routes, and travel time. *Cluster 5 (the purple cluster)* is with 32 keywords and is termed mining and soil erosion consisting of main keywords as metal, soil, trace elements, mining, waste, and bioremediation.

Next, we conducted a bibliometric coupling of countries using VOSviewer with criteria of at least five documents per country. This emerged in a total of six clusters. The largest cluster consists of a total of seven nations, which are Australia, France, India, Iran, Israel, and Singapore. Turkey is also included in this group. Next, *Cluster 5* included the countries such as Denmark, Estonia, Germany, the Netherlands, and the United Kingdom. The following step involves the formation of a cluster consisting of four countries: Hungary, Japan, Malaysia, Poland, and Serbia. Both Cluster 4 and Cluster 5 are made up of four and three countries, respectively. Countries such as Canada, China, Sweden, and the United States make up the members of Cluster 4. The countries that make up Cluster 5 include Brazil, Portugal, and Spain. Greece and Italy are the nations that make up Cluster 6.

A critical perspective and future research agenda

The research in the green corridor field is active since 1990 or even before with probably different names such as “sustainable infrastructure,” green transport corridors,” and “urban green ways,” but the research did not garner a good number of citations. The average citations per year as well as average citations per publication are far below average than similar topics evolved in a similar era. The research visibility of this domain needs to enhance by collaboration and encouraging multidisciplinary publications.

In addition, the review studies in this domain are sparse. In nearly three decades, just two Scopus-indexed studies can be retrieved that synthesized green corridor literature. These studies are surprisingly published in or after 2020 and therefore can be considered that such efforts are recently started. In the absence of systematic review, unwinding extant literature and identification of research gaps to provide a call for the future are pending matters in this domain.

China emerged as a top contributor to green corridor research in terms of research output generated through published papers. However, the research in this firm is dominated by developed countries. In the list of top 10 countries by publication, only three (China, India, and Brazil) are developing economies. In the category of developed countries, there is representation from North America (the United States and Canada) and Europe (the United Kingdom, Germany, France, and Italy). Despite this fact, surprisingly, developed countries like Australia, northern European countries, and Singapore are not listed as top contributors to the field research. The work in the Asian and Australian continents needs to be encouraged as this region is affected by the negative impact of climate change and related consequences.

The funding agencies must initiate calls for grant proposals as currently most of the funding is on the national level. The top funding contributor on the topic is the National Natural Science Foundation of China and the European Commission. International corporations such as World Bank and IMF also can encourage funding in this context. In addition, regional bodies in Asia such as Asian Development Bank can encourage work in this part of the world.

When it comes to the subject domain, a heavy volume of literature is published in the field of environmental science followed by the field of social science. In this case, further research on the topic in the field of business management, psychology, computing, information systems, and energy is encouraged. From the perspective of green corridors, it is evident that although research on this topic is slowly expanding, it is unclear why the leading global development agencies have remained silent on this issue (Table 1).

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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