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From Industrial Sites to Recreational Spaces: A Global Bibliometric Analysis (2005-2024)

Endüstriyel Alanlardan Rekreasyon Alanlarına: Küresel Bibliyometrik Analiz (2005-2024)

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Abstract

The conversion of industrial areas into recreational spaces is gaining increasing importance on a global scale in terms of sustainable urban development and the preservation of ecosystem services. This study aims to reveal the twenty-year development of the scientific literature on the recreational transformation of industrial areas between 2005 and 2024 from a global perspective. The study examined 368 scientific articles obtained from the Web of Science (WoS) database using bibliometric analysis methods. Bibliometrix R (RStudio) statistical analysis software was used for performance analysis, and VOSviewer statistical analysis software was used for scientific mapping analysis. According to the performance analysis results, it was determined that the scientific studies on the research topic were most frequently published in the English language, in the year 2023, and in the research field of Environmental Sciences-Ecology. The study with the highest number of citations was found to be the research conducted by Tu (2011), which examined the relationship between land use and water quality. In the scientific mapping analysis, it was found that "Li, H.", "Zhou, Y.", "Liu, I." and "Xu, Z." had the most articles based on authors, while the "USA" was found to be the leader in terms of the number of articles, number of citations and scientific collaboration based on countries. Keyword analysis revealed that the concepts of "ecosystem services", "management", "water", "recreation", "cities" and "conservation" were prominent. Consequently, it has been established that research into the recreational conversion of industrial areas is particularly concentrated in the contexts of environmental sustainability, ecosystem services and urban planning, and that the United States and China share scientific leadership in this field. This study provides researchers and policymakers with a comprehensive literature map on the conversion of post-industrial areas.

Keywords Post-Industrial Transformation, Recreation, Ecosystem Services, Sustainable Urban Development.

Öz

Endüstriyel alanların rekreasyon alanlarına dönüştürülmesi, sürdürülebilir kentsel gelişim ve ekosistem hizmetlerinin korunması açısından küresel ölçekte giderek daha fazla önem kazanmaktadır. Bu çalışma, 2005 ile 2024 yılları arasında endüstriyel alanların rekreasyon amaçlı dönüşümüne ilişkin bilimsel literatürün yirmi yıllık gelişimini küresel bir perspektiften ortaya koymayı amaçlamaktadır. Çalışmada, Web of Science (WoS) veritabanından elde edilen 368 bilimsel makale bibliyometrik analiz yöntemleri kullanılarak incelenmiştir. Performans analizi için Bibliometrix R (RStudio) istatistiksel analiz yazılımı, bilimsel haritalama analizi için ise VOSviewer istatistiksel analiz yazılımı kullanılmıştır. Performans analizi sonuçlarına göre, araştırma konusuna ilişkin bilimsel çalışmaların en sık İngilizce dilinde, 2023 yılında ve Çevre Bilimleri-Ekoloji araştırma alanında yayınlandığı belirlenmiştir. En çok atıf alan çalışma, arazi kullanımı ve su kalitesi arasındaki ilişkiyi inceleyen Tu (2011) tarafından yürütülen araştırma olarak tespit edildi. Bilimsel haritalama analizinde, yazar bazında en çok makaleye sahip olanların "Li, H.", "Zhou, Y.", "Liu, I." ve "Xu, Z." yazar bazında en fazla makaleye sahipken "ABD" ülke bazında makale sayısı, atıf sayısı ve bilimsel iş birliği açısından lider olduğu tespit edilmiştir. Anahtar kelime analizi, "ekosistem hizmetleri", "yönetim", "su", "rekreasyon", "şehirler" ve "koruma" kavramlarının öne çıktığını ortaya koymuştur. Sonuç olarak, endüstriyel alanların rekreasyon amaçlı dönüştürülmesine yönelik araştırmaların özellikle çevresel sürdürülebilirlik, ekosistem hizmetleri ve kentsel planlama bağlamlarında yoğunlaştığı ve bu alanda bilimsel liderliğin ABD ve Çin arasında paylaşıldığı tespit edilmiştir. Bu çalışma, araştırmacılara ve politika yapıcılarına post-endüstriyel alanların dönüştürülmesine ilişkin kapsamlı bir literatür haritası sunmaktadır.

Anahtar Kelimeler: Post-Endüstriyel Dönüşüm, Rekreasyon, Ekosistem Hizmetleri, Sürdürülebilir Kentsel Gelişim.

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Introduction

The industrialization process has fundamentally transformed urban and rural landscapes worldwide. However, since the second half of the 20th century, the deindustrialization process experienced in many countries has resulted in vast areas of abandoned factories, mining sites, and industrial zones becoming derelict (Loures, 2015). While these post-industrial areas create problems such as environmental pollution, visual degradation, and social decline, they also present significant opportunities for urban transformation and sustainable development (Mathey et al., 2015). In recent years, the conversion of these areas into recreational spaces, green infrastructure, and public spaces providing ecosystem services has attracted increasing global attention.

Scholarly inquiry into the recreational transformation of industrial areas has evolved considerably over the past two decades, drawing from multiple disciplinary perspectives. At its core, this body of research addresses the complex challenges associated with brownfield rehabilitation—a term widely used to describe the process of repurposing contaminated or underutilized industrial lands for new functions (De Sousa, 2003). What makes this field particularly compelling is its intersection with several critical environmental and social concerns: urban green space planning, the restoration of degraded ecosystems, sustainable water resource management, and the protection of biodiversity in urbanized regions. Central to much of this discourse is the framework of ecosystem services, which conceptualizes the myriad benefits that natural and semi-natural environments provide to human populations (Millennium Ecosystem Assessment, 2005).

Given the interdisciplinary nature and expanding scholarly interest in post-industrial landscape transformation, a systematic bibliometric examination of the existing literature becomes essential for mapping research trajectories and identifying knowledge gaps. In a review of the international literature; theses (Korkmaz & Cetinkaya, 2019; Camps et al., 2005; Akkaşoğlu et al., 2019), scientific journals (Khan et al., 2021; Kumar and Kushwaha, 2015; Fu and Ho, 2015; Gaviria-Marin et al., 2018), countries (Confraria & Godinho, 2015; Mouton & Blanckenberg, 2018; Matveeva et al., 2022), universities (Cancino et al., 2017; Gumpenberger et al., 2012; Mokhnacheva & Kharybina, 2011), and research topics (Da Silva & De Souza, 2021; Djeki et al., 2022; Paylı, 2024; Farooq et al., 2021; Hasbullah, 2021) have been conducted, and bibliometric analyses related to performance/scientific mapping based on the identified academic components have been performed. Despite the growing body of research on post-industrial landscape transformation and recreational rehabilitation, no comprehensive bibliometric study has systematically examined this literature from a global perspective over an extended timeframe. This gap in the scholarly discourse limits our understanding of how research priorities have evolved, which countries and institutions have emerged as leaders, and what conceptual themes dominate the field. Accordingly, the present study aims to address this lacuna by providing a twenty-year bibliometric analysis (2005-2024) of scientific publications concerning the recreational transformation of industrial areas. The objectives of this research are threefold: (1) to analyze the performance

characteristics of publications across language, year, research field, and indexing status; (2) to map the social structure of the field through author and country collaboration networks; and (3) to reveal the conceptual structure via keyword co-occurrence analysis.

The recreational transformation of post-industrial areas yields multifaceted benefits that extend across environmental, social, and economic dimensions. From an environmental standpoint, such transformations facilitate soil and water remediation, enhance carbon sequestration capacity, and support biodiversity conservation efforts (Haase et al., 2014). The social dividends are equally compelling: improved public health outcomes, enhanced urban quality of life, and the creation of spaces that foster community interaction and social cohesion. Economic considerations further strengthen the case for recreational redevelopment, as evidenced by increased property values in adjacent areas, growth in tourism-related revenues, and the generation of new employment opportunities (Litt et al., 2002). This convergence of environmental, social, and economic benefits has positioned the recreational transformation of post-industrial landscapes as a distinctly interdisciplinary field of scholarly inquiry, one that continues to attract researchers from urban planning, environmental science, public health, and recreation studies. In this context, the performance of scientific studies focusing on the research topic of "industrial recreation" (article) literature review on "industrial recreation" is reflected in the scientific world by revealing its performance, social and conceptual structures in a multifaceted manner (publication language, year, research area, related article, scientist, citation, country, scientific collaboration, etc.), it can be stated that it has strategic importance as it benefits many sectors, organizations/businesses, scientists, countries, universities, etc. Thus, it can be stated that the industrial recreation activity that the relevant businesses will implement among their employees will contribute positively to themselves and the country as a whole in many ways, such as imports, exports, employment, economy, gross national product, etc., depending on the increase and efficiency in their activity/production areas.

Firstly, the literature review of the study was carried out, then the methodology, findings and analyses were included, and performance and scientific mapping analyses were made based on the data and findings obtained, and then evaluations were made on the analyses carried out and reported and recommendations were made.

Literature Review

This section provides a theoretical framework for understanding the recreational transformation of post-industrial landscapes, examining key concepts, approaches, and the current state of scholarly inquiry in this interdisciplinary field.

Post-Industrial Landscapes and Recreational Transformation

Post-industrial landscapes encompass a diverse range of sites that have ceased their original productive functions, including abandoned factories, decommissioned power plants, former mining areas, disused railway yards, and obsolete port facilities (Loures & Panagopoulos, 2007). These spaces, often referred to as brownfields in North American and European planning discourse, present unique challenges due to potential soil contamination, structural deterioration, and negative perceptions among local

communities (De Sousa, 2003). However, they also offer significant opportunities for urban regeneration when approached through innovative planning and design strategies.

The ecosystem services framework has emerged as a particularly valuable lens through which to evaluate the transformation of post-industrial sites into recreational spaces. This framework, which gained prominence following the Millennium Ecosystem Assessment (2005), categorizes the benefits derived from ecosystems into four main types: provisioning services, regulating services, cultural services, and supporting services. Recreational areas created from former industrial sites primarily contribute cultural ecosystem services, including opportunities for physical activity, aesthetic enjoyment, educational experiences, and social interaction (Haase et al., 2014).

Globally, numerous successful examples demonstrate the potential of transforming industrial heritage into vibrant recreational destinations. Germany's Ruhr Valley, once the heart of European coal and steel production, has been reimagined as a network of parks, cultural venues, and recreational facilities through the International Building Exhibition (IBA) Emscher Park initiative (Mathey et al., 2015). Similarly, projects such as the High Line in New York City, Gas Works Park in Seattle, and Landschaftspark Duisburg-Nord in Germany illustrate how creative design approaches can preserve industrial heritage while providing contemporary recreational amenities. These transformations not only address environmental remediation needs but also contribute to community identity, public health improvement, and economic revitalization.

The growing scholarly interest in post-industrial landscape transformation reflects broader concerns about sustainable urban development, climate change adaptation, and the creation of resilient cities. As urban populations continue to expand and the pressure on green spaces intensifies, the strategic repurposing of former industrial sites offers a pragmatic solution that addresses multiple urban challenges simultaneously (Litt et al., 2002). Furthermore, the preservation and adaptive reuse of industrial heritage elements within these transformed landscapes contributes to maintaining cultural continuity and sense of place, aspects increasingly recognized as essential components of successful urban regeneration initiatives.

Despite the growing body of research on post-industrial landscape transformation, no comprehensive bibliometric analysis has yet been conducted to systematically examine the evolution, structure, and trends of this scholarly field. While individual case studies and thematic reviews exist, a holistic understanding of how research in this domain has developed over time, which authors and institutions have been most influential, and what conceptual themes have emerged remains lacking. This study addresses this gap by conducting a rigorous bibliometric analysis of scientific articles published between 2005 and 2024, thereby providing a systematic overview of the field's intellectual landscape and identifying directions for future research.

Methodology

Scientists reported that they obtained ethical permission/approval to obtain data for their scientific studies (Paylı, 2024; Khan et al., 2024; Bay et al., 2023; Kepes et al., 2024; Er et al., 2022; Vályi et al., 2024; Ilmi, 2024; Bay & Paylı, 2022), and that they did not obtain the relevant ethical permission/approval due to justified reasons (Yoo et al., 2023;

Pham et al., 2023; Turk et al., 2023; Mermer & Özsezer, 2023). At the same time, scientists explain in their studies that they did not obtain ethical permission / approval in obtaining data related to bibliometric analysis based on literature review (Chowdhry et al., 2023; Paylı, 2024; El Rassi et al., 2018; Paylı & Çevik, 2025; Kim & Hwang, 2024; Çevik et al., 2025; Ozsoy & Demir, 2018; Paylı, 2024; Öget et al., 2024; Sheridan et al., 2018; Sweileh, 2018; Çevik et al., 2025; Thi-Nga et al., 2024; Wang & Zhao, 2018). In this context; since the scientific study within the scope of bibliometric analysis, which is carried out to reveal the twenty-year journey of "industrial recreation" research in a global perspective, is a literature review, ethical permission / approval has not been obtained.

In this section of this study; the purpose, importance, population and sample, limitations, determination of the database and search strategy, formulation of the research questions, conducting the relevant search and obtaining the data, research stages and analysis techniques and methods used in the study are explained under separate headings below.

Purpose and Importance of the Research

In the review of the international literature, there is no bibliometric analysis study that reveals the journey of scientific studies (theses, papers, books, etc.) and articles in the world of science in the focus of "industrial recreation" research topic in a global perspective. In this context; it is aimed to close this gap in the literature by revealing the twenty-year journey of scientific article studies in the focus of "industrial recreation" research topic in a global perspective through bibliometric analyses.

These objectives are analysed in three different structures in terms of scope. These are:

- Performance status of articles on the research topic "Industrial recreation" within the framework of publication language, year, research area and field / indexes,
- To analyse the social structures of article studies on the relevant research topic and
- It can be explained as revealing the conceptual structures of the scientific articles in the focus of the research topic.

It is known that a large number of scientific studies have been carried out in the international literature with a focus on recreation research. It can be said that the findings and results obtained from these studies emphasise the contributions and effects they provide to society and people as well as many sectors. It can be stated that the recreational events/activities that individuals working in organisations/businesses do by themselves or with their colleagues at work contribute to their physical, mental and mental aspects and their success in the workplace. In parallel with this, it can be said that it has effects on increasing the production capacity of the relevant workplace in the field in which it operates. For this reason, it can be stated that this study is of strategic importance for organisations (all enterprises, institutions and organisations), as it will make positive contributions in terms of production capacity, productivity, efficiency, effectiveness, organisational commitment, organisational loyalty, unity and solidarity, solidarity, etc., to provide, mediate and source economic, social, personal, etc. Opportunities that will facilitate the participation of their employees in recreational activities/activities and their participation in these activities.

Research Population and Sample

It is stated that scientific researches are conducted within the scope of the universe and sample determined within the framework of the relevant research subject (Paylı & Çevik, 2025). In this context; all scientific studies on the subject of "industrial recreation" that have been added to the literature and stored in the Web of Science database constitute the population of the research. The sample of the research consists of scientific article studies that have been included in the literature on the relevant research topic and are included in the same database.

Research Limitations

There are some limitations in conducting scientific studies (Paylı, 2024). There are some limitations regarding the conduct of the relevant study. These are;

- ✓ Related study articles within the scope of 2005-2024,
- ✓ Some academic components of the research topic (year and language of publication, field/scan index and research area),
- ✓ Web of Science database of research only,
- ✓ VOSviewer and Biblometrix R (RStudio) Statistical Analysis Programme
- ✓ RIS, Fast 5000 and BibTex datasets of tests and analyses
- ✓ It can be listed as performing the analyses within the scope of the relevant table, picture, word cloud, world map.

Determination of Research Database and Strategy

As many scientific studies conducted by scientists are reflected in the literature, many databases are utilised in related studies. In the literature review; Web of Science (Vlase & Lähdesmäki, 2023; Paylı & Çevik 2025; Archambault et al. 2009; De Winter et al., 2014; Vuong et al. 2020; Paylı, 2025; Martín-Martín et al. 2018; Mohsen et al., 2017), PubMed (Hunter & Cohen, 2006; Roberts, 2001; Mendis et al., 2015; Vioque et al., 2010; Song et al., 2014), Google Scholor (Pölönen & Hammarfelt, 2020; Nandiyanto & Al Husaeni, 2022; Mayr & Walter, 2007; Kousha & Thelwall, 2007), Scopus (Aman, 2018; Azmi & Hussain, 2021; Dinh et al., 2023; Gupta & Dhawan, 2009), Demensions (Rusydiana, 2021; Vaske et al., 2006; Hakkaraki, 2023), etc. It has been determined that it has been used / utilised in many scientific studies in many different databases. According to Gürler (2021), it is the Web of Science (WoS) database, which is preferred by the world's most common and old scientists. In this context; WoS database was used in the literature review of the related research.

Formulation of Research Questions

Some questions (P) were constructed in order to achieve the objectives of revealing the performance status, social and conceptual structures of the twenty-year journey of scientific article studies on the research topic of "industrial recreation" in a global perspective through bibliometric analyses. The relevant question parameters (P_1-P_8) can be listed as follows:

"industrial recreation" is the focus of the research topic;

- ✓ What is the status of universal development of related scientific studies within the framework of the language of publication? (P_1)
- ✓ What is the status of evolutionary change and development within the framework of the year of publication of the relevant articles? (P_2)
- ✓ How is the universal development status of the relevant articles within the framework of the determined research areas? (P_3)
- ✓ What is the field/index status of the journals in which the relevant articles are published? (P_4)

- ✓ In a global perspective, how were the top 5 most cited articles on the research topic "industrial recreation" ranked? (P_5)
- ✓ What is the status of the relevant articles in terms of social structure (authors) and (countries) in the global perspective? (P_6) and (P_7)
- ✓ How is the conceptual structure of the related articles in global perspective? (P_8)

The answers corresponding to the question parameters listed above (C_1-C_8) are planned to be reached through bibliometric analyses to be performed on the relevant tables and scientific maps.

Conducting the Screening and Obtaining the Relevant Data

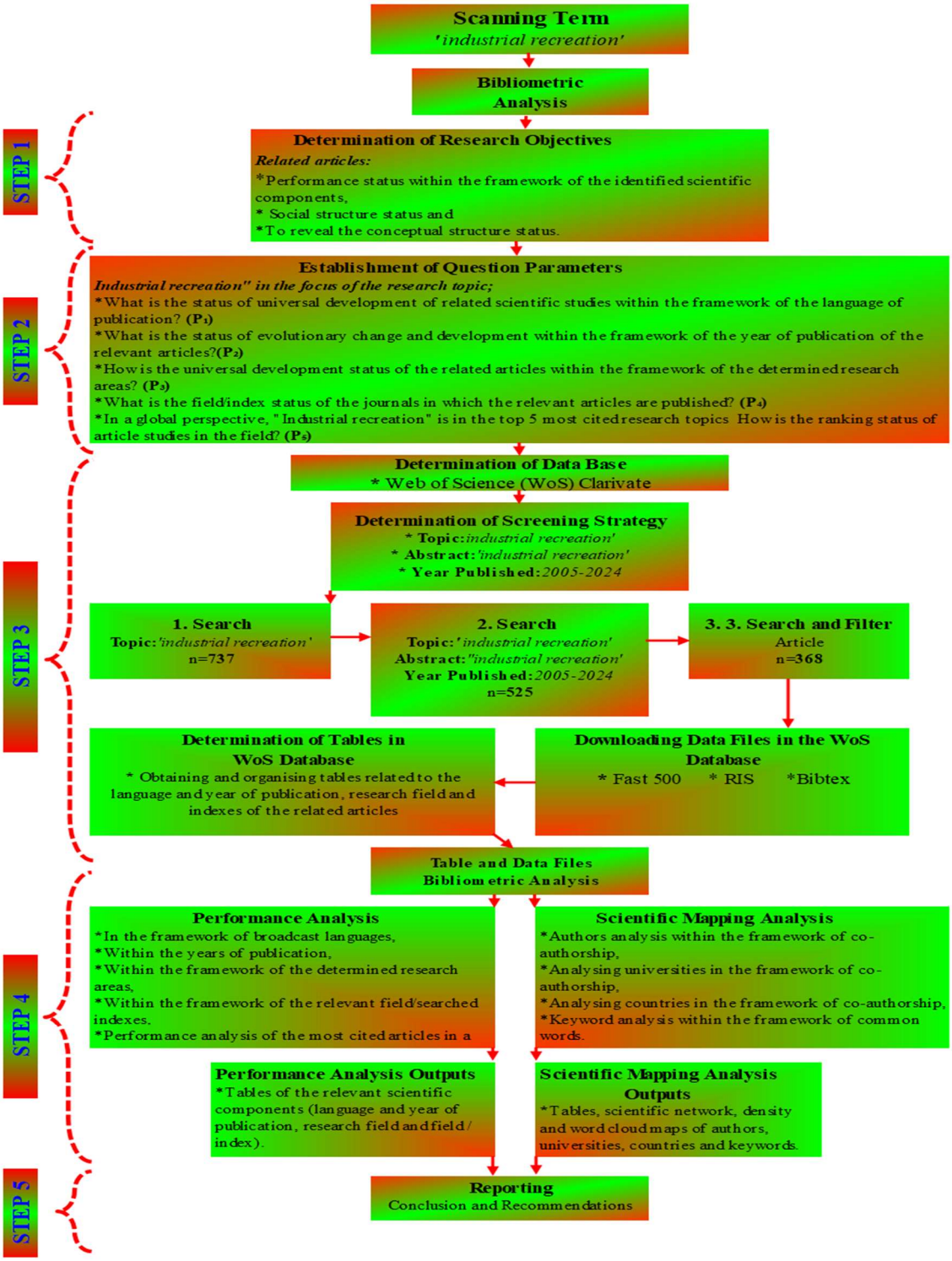
The WoS database was used to obtain scientific studies and articles on the research topic of "industrial recreation". In the context of obtaining the answers to the question parameters formed in line with the objectives of the research, the search strategy was determined. Related search strategy: Topic ("industrial recreation") And Abstract ("industrial recreation") And Year Published ('2005-2024'). In this context; the searches/search applications and the results of the findings can be stated as follows: The search term 'industrial recreation' was employed as it encompasses studies examining the transformation of industrial sites into recreational spaces, including post-industrial landscape redevelopment, brownfield regeneration, and the creation of urban green infrastructure on former industrial lands.

- ✓ 1. Search/Search: In order to access the relevant scientific studies (articles, theses, dissertations, books, papers, book chapters, etc.) in the WoS database, "Topic: ("industrial recreation")" was searched in the search tab and scientific studies (n=737) were accessed.
- ✓ 2. Search/Search: The search tab of the relevant database and Abstract: ("industrial recreation") and Year Published: ('2005-2024') were typed and scientific studies (n=525) were accessed.
- ✓ 3. In the Search/Search: the relevant database search tab And Article "Article" And Language (Language) was typed and scientific studies were selected and filtering was performed. Thus, the desired scientific article studies (n=368) on the research topic "Industrial recreation" were reached.

Following the identification and access of the scientific article studies requested for the purposes of the study, the tables containing the quality and quantity indicators of the relevant articles on the WoS data base and the RIS, Fast 5000 and BibTex data files where they are stored were downloaded on 20/04/2025, 15:51.

Stages of the Research

It is stated that all bibliometric analyses performed on the WoS database and the tables and data files of articles on the subject of research from this database can be performed in five stages (Paylı, 2025). The relevant stages of bibliometric analysis are presented in Figure 1 below.



* (The relevant bibliometric analysis stages related to the research topic were created by the authors)

Figure 1: Bibliometric Analysis Stages (for Research Topics)

Programmes, Analysis Techniques and Methods Used in the Research

In the international literature review, VOSviewer (Yu et al., 2020; Paylı, 2024; Kuzior & Sira, 2022; Shah et al., 2020; Jia & Mustafa, 2023; Paylı & Çevik, 2025; Tamala et al., 2022; Xu & Wang, 2025), Bibliometrix R (Guleria & Kaur, 2021; Ab Rashid, 2023; Paylı, 2025; Zhong et al, 2024; Ghosh & Prasad, 2021; Ejaz et al., 2022; Bhat et al., 2023; Gupta & Madhukar, 2020). In addition, many data files such as EndNote Desktop, EndNote Online, Excel, Other File Formats (RIS), Claim on Publons-track citations, InCites, Print,

Email, Fast 5000/5K are used in performing bibliometric analyses (Koç, 2021). In this context; two different statistical analysis programs and Fast 5000/5K and RIS (Other file formats) and BibTex data files were used in the testing and analysis of the tables and data files obtained in the research. VOSviewer was used in the testing and analysis of Fast 5000 and RIS data files, and Bibliometrix R (RStudio) Statistical analysis program was used in the testing and analysis of BibTex data file. "industrial recreation" related to scientific article studies on the research topic: Performance analyses were performed on the tables obtained from the WoS database and the tables obtained as a result of the BibTex data file test. Tabular and scientific mapping analyses based on scientific network, density, word cloud, etc. Obtained as a result of the test of Fast 5000, RIS and BibTex data files were made.

Results

In line with the objectives of the research, many findings and findings have been reached by performing performance analyses on the relevant tables obtained from the WoS database and BibTex data file tests. Scientific mapping analyses were performed on the outputs obtained as a result of the tests of the Fast 5000, RIS and BibTex data files obtained from the same database in the relevant analysis programme, and many findings and determinations were made. As a result of the relevant analyses, the studies carried out to make the findings and determinations are explained under separate headings below.

In the examination of the relevant tables containing the data obtained in the research, the letters "G", "H", "I", "J" and "K" were used as symbols in "Sn" to facilitate the analyses and to ensure comprehensibility.

Performance Analysis

The performance analyses performed on the relevant tables obtained from the WoS database and the tables obtained as a result of the test of the BibTex data file are explained separately in the sub-headings below.

Performance Analysis in the Publication Languages Framework

In order to reveal the journey of scientific studies (papers, books, book chapters, articles, etc.) that have been included in the international literature with the focus on the research topic of "industrial recreation" in a global perspective and the performance status within the framework of the language of publication (all languages), Table 1, which was accessed as an output from the WoS database, is presented below for examination.

Table 1: Distribution of the Languages of Publication of Related Scientific Studies

Sn	Publishing	n	Sn	Publishing	n
G_1	English	324	G_6	Ukrainian	2
G_2	Russian	17	G_7	Croatian	1
G_3	Spanish	9	G_8	French	1
G_4	Portuguese	7	G_9	German	1
G_5	Polish	5	G_{10}	Italian	1

In the analysis made on Table 1; it has been determined that scientific studies on the subject of "industrial recreation" have been published in 324 "English", 17 "Russian" and 9 "Spanish" languages and have been included in the international literature and are in the first three places. It has been determined that at least 1 scientific study in the focus of the research subject has been brought to the literature in the language of "Croatian", "French", "German" and "Italian". In the context of these findings, it has been determined

that in the focus of the research topic of "industrial recreation", it has been determined that the scientific study has been brought to the international literature within the scope of the language of publication of the scientific study in the focus of "industrial recreation", the most in "English" (G_1) and the least in "Croatian", "French", "German" and "Italian" (G_7-G_{10}) language of publication.

Based on the determination that scientific article studies on the research topic of "industrial recreation" are mostly in the "English" language, in the performance and scientific mapping analyses carried out below on the relevant research topic, scientific article studies in the "English" (G_1) publication language have been taken into consideration.

Performance Analysis in terms of Years of Publication

In order to reveal the journey of the scientific articles in the international literature in the global perspective and the performance status within the framework of the year of publication (2005-2024) within the focus of the research topic "industrial recreation", Table 2, which was accessed as an output from the WoS database, is presented below for examination.

Table 2: Distribution of Related Articles Regarding Years of Publication

Sn	Relevant Years	n	Sn	Relevant Years	n
H_1	2024	23	H_{13}	2014	18
H_2	2023	35	H_{14}	2013	8
H_3	2022	28	H_{15}	2012	14
H_4	2021	31	H_{16}	2011	15
H_5	2020	27	H_{17}	2010	15
H_6	2019	21	H_{18}	2009	16
H_7	2018	22	H_{19}	2008	12
H_8	2017	26	H_{20}	2007	13
H_9	2016	17	H_{21}	2006	4
H_{10}	2015	18	H_{22}	2005	5

In the examination made on Table 2; Within the scope of the years 2005-2024, it was determined that 368 (H_1-H_{22}) scientific article studies were brought to the international literature in the focus of the research topic. It was determined that 35 articles in "2023", 31 in "2021" and 28 in "2022" were brought to the international literature and ranked in the top three in the focus of "industrial recreation". It was determined that at least 4 articles in "2006" and 5 articles in "2005" were brought to the literature in the focus of the research topic. In the context of these findings, it has been determined that in the focus of the research topic "industrial recreation", it has been determined that the scientific work has been brought to the international literature within the scope of the year of publication in "2023" (H_2) and the least in "2006" (H_{21}).

Performance Analysis within the Framework of Related Research Areas

In order to reveal the journey of scientific articles in the international literature in the global perspective and the performance status within the framework of the determined research area within the focus of the research topic of "industrial recreation", Table 3, which was accessed as an output from the WoS database, is presented below for examination.

Table 3: Distribution of Related Articles Regarding the Determined Research Areas

Sn	Identified Relevant Research Areas	n	Sn	Identified Relevant Research Areas	n
I_1	Environmental Sciences-Ecology	151	I_{28}	Material Science	3
I_2	Engineering	33	I_{29}	Meteorology Atmospheric Science	3
I_3	Science Technology Other Topics	33	I_{30}	Mining Mineral Processing	3
I_4	Water Resources	32	I_{31}	Psychology	3
I_5	Social Sciences Other Subjects	27	I_{32}	Art	2
I_6	Business Economics	25	I_{33}	Biotechnology Applied Microbiology	2
I_7	Geology	24	I_{34}	Contact	1
I_8	Forestry	20	I_{35}	Construction Building Technology	1
I_9	History	20	I_{36}	Developmental Biology	1
I_{10}	Geography	19	I_{37}	Education-Education Research	1
I_{11}	Marine Freshwater Biology	15	I_{38}	Energy Fuels	1
I_{12}	Chemistry	11	I_{39}	Film Radio Television	1
I_{13}	Agriculture	10	I_{40}	Fisheries	1
I_{14}	Public Administration	10	I_{41}	Imaging Science Photography Technology	1
I_{15}	City Studies	10	I_{42}	Information Science-Library Science	1
I_{16}	Arts Humanities Other Subjects	9	I_{43}	Nervous Sciences Neurology	1
I_{17}	Protection of Biological Diversity	9	I_{44}	History Philosophy of Science	1
I_{18}	Physical Geography	8	I_{45}	Instruments-Instrumentation	1
I_{19}	Architecture	7	I_{46}	Mineralogy	1
I_{20}	Computer Science	7	I_{47}	Operations Research Management Science	1
I_{21}	Public Environment Occupational Health	7	I_{48}	Philosophy	1
I_{22}	Development Studies	5	I_{49}	Rehabilitation	1
I_{23}	Plant Sciences	5	I_{50}	Social Issues	1
I_{24}	Sociology	4	I_{51}	Social Services	1
I_{25}	Archaeology	3	I_{52}	Sport Sciences	1
I_{26}	Field Studies	3	I_{53}	Veterinary Sciences	1
I_{27}	Life Sciences Biomedical Other Topics	3	I_{54}	Zoology	1

The analysis of Table 3 shows that 151 articles in "Environmental Sciences-Ecology", 33 articles in "Engineering" and "Science Technology Other Topics", 32 articles in "Water Resources", 27 articles in "Social Sciences Other Topics" and 25 articles in "Business Economics" (I_1-I_6) have been brought to the international literature and are in the top five. "Communication", "Construction Building Technology", "Developmental Biology", "Education-Educational Research", "Energy Fuels", "Film Radio Television", "Fishing", "Imaging Science Photo Technology", "Information Science-Library Science", "Neuroscience Neurology", "History Philosophy of Science", In the research fields of "Instruments-Instrumentation", "Operations Research Management Science", "Philosophy", "Rehabilitation", "Social Issues", "Social Services", "Sports Sciences", "Veterinary Sciences" and "Zoology" (I_{34}-I_{54}), it was determined that 1 article was brought to the international literature and ranked last. In the context of these determinations; it has been determined that the scientific work in the focus of the research topic of "industrial recreation" has been brought to the international literature within the scope of the fields of publication of the scientific work, and it has been determined that it performs the most in "Environmental Sciences-Ecology" and the least in the research fields between I_{34}-I_{54} (included).

Performance Analysis within the Framework of Field/Scanned Indexes

In order to reveal the global journey of scientific articles in the international literature with a focus on the research topic of "industrial recreation", and the performance status of the scientific journals in which they are published within the framework of the indexes linked to the field / indexes in which they are indexed, Table 4, which was accessed as an output from the WoS database, is presented below for examination.

Table 4: Distribution of the Indexes of the Journals in which the Related Articles are Published

Sn	Related Indexes	n
J_1	Science Citation Index Expanded (SCI-EXPANDED)	179
J_2	Emerging Sources Citation Index (ESCI)	108
J_3	Social Sciences Citation Index (SSCI)	104
J_4	Arts & Humanities Citation Index (A&HCI)	24
J_5	Book Citation Index-Science (BKCI-S)	14
J_6	Conference Proceedings Citation Index-Science (CPCI-S)	9
J_7	Book Citation Index-Social Sciences & Humanities (BKCI-SSH)	5
J_8	Conference Proceedings Citation Indekx-Social Science & Humanities (CPCI-SSH)	1

In the examination made on Table 4, it has been determined that in the scientific journals indexed in "SCI-EXPANDED" 179, "ESCI" 108, "SSCI" (J_1-J_3), 104 scientific article studies have been brought to the international literature and are in the top three in the focus of "industrial recreation". In the focus of the research topic, it has been determined that 1 article study has been brought to the international literature in scientific journals indexed in the "CPCI-SSH" (J_8) index and is in the last place. In the context of these determinations; In the focus of "industrial recreation" research topic, it has been determined that the journals in which scientific studies are published are indexed within the scope of the indexes in which the indexes are indexed, at most in the "Science Citation Index Expanded (SCI-EXPANDED), and at least in the Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH) indexes.

Performance Analysis within the Framework of Citation in Global Perspective

Table 5, which was obtained as an output from the WoS database, is presented below for examination in order to reveal the performance status of the scientific articles brought to the international literature in the global perspective within the framework of citations within the focus of "industrial recreation" research topic.

Table 5: Distribution of Citations to Related Articles at Global Level

Sn	Author, Yıl, Journal	Doi	n_1
K_1	(Tu, 2011), Applied Geography	10.1016/j.apgeog.2010.08.001	259
K_2	(Li et al., 2016), Ecological Indicators	10.1016/j.ecolind.2016.07.017	248
K_3	(Kuo & Chen, 2009), Journal of Cleaner Production	10.1016/j.jclepro.2009.04.012	154
K_4	(Langemeyer et al., 2020), Science of the Total Environment	10.1016/j.scitotenv.2019.135487	138
K_5	(Jo & Seo, 2005), Chemosphere	10.1016/j.chemosphere.2005.04.103	132
K_6	(Zhang et al., 2021), Science of the Total Environment	10.1016/j.scitotenv.2020.142480	120
K_7	(Olmstead, 2010), Review of Environmental Economics and policy	10.1093/reep/req004	119
K_8	(Liu et al., 2020), Environmental Pollution	10.1016/j.envpol.2020.114083	117
K_9	(Peña-Fernández et al., 2014), Environment International	10.1016/j.envint.2014.04.007	116
K_{10}	(Ghorbanzadeh et al., 2019), Fire	10.3390/fire2030050	114

In the examination made on Table 5; It has been determined that the most cited article studies (Tu, 2011; Li d. 2016; Kuo & Chen, 2009; Langemeyer et al., 2020; Jo & Seo, 2005; Zhang et al., 2021; Olmstead, 2010; Liu et al., 2020; Peña-Fernández et al., 2014; Ghorbanzadeh et al., 2019) on the research topic "industrial recreation" in the global perspective. Based on these findings; in terms of the total number of citations in the global perspective, the scientific article published in the Journal of Applied Geography with doi address 10.1016/j.apgeog.2010.08.001, which has the highest number of citations in terms of the total number of citations in the global perspective, ranked 1 with 259 citations, 10.1016/j.ecolind.2016 .07.017 with a doi address of 10.1016/j.jclepro.2009.04.012 and published in the Journal of Cleaner Production, ranked 3rd with 154 citations. In addition, the number of citations to other scientific papers between K_4-K_{10} (inclusive) is also noteworthy.

Scientific Mapping Analysis

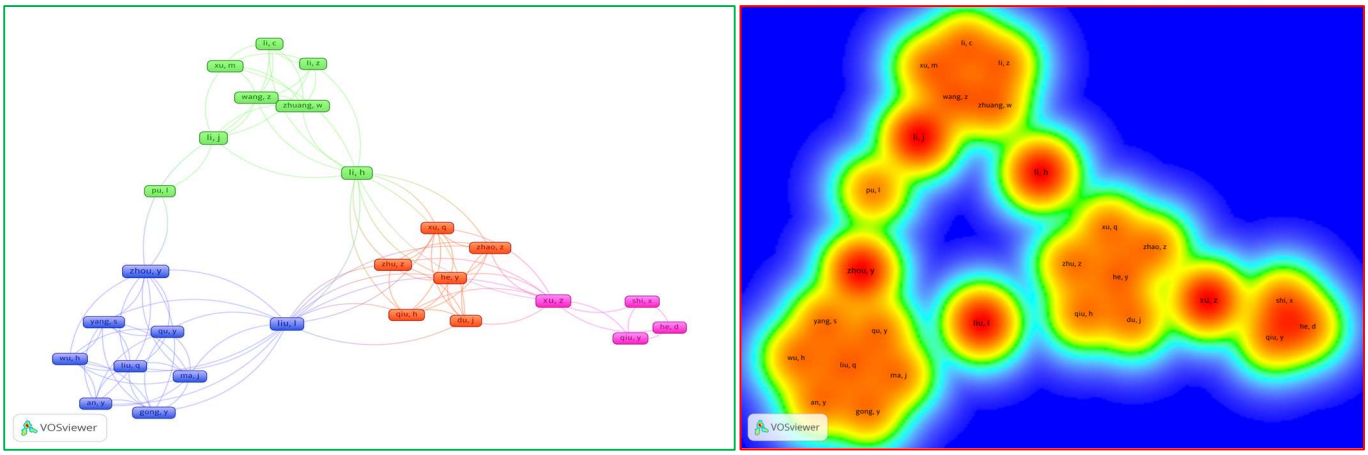
The scientific mapping analyses performed on the tables, scientific network, density, word cloud, etc. Obtained as a result of the test of Fast 5000, RIS and BibTex data file, which contain analytical data related to the scientific components of scientific article studies on the research topic of "industrial recreation" from the WoS database, are explained separately below under subheadings.

Inter-Author Analysis within the Framework of Co-Author

Fast 5000 data file was introduced to the VOSviewer Statistical Analysis Programme to be tested in order to reveal the twenty-year journey of the researches (articles) on the subject of "industrial recreation" in the global perspective and the social structures between authors within the framework of co-author. The relevant data file was selected by determining threshold values in the analysis programme base in order to determine the number of articles and citations and total link strength values between authors within the framework of co-authorship. In this context, the threshold values determined can be stated as follows:

- ✓ Type of Analysis: Co-author,
- ✓ Analysis Unit: Authors,
- ✓ Counting Method : Full Count and
- ✓ Minimum number of articles by one author: 1
- ✓ Minimum number of citations for an author: 1

The relevant data file was tested within the framework of the threshold values mentioned above and it was determined that 969 authors out of 1130 authors met the selected threshold values. Verif selected author data output was obtained, which includes the number of scientific articles, citations and total link strength (scientific collaboration) values of 969 authors who met the relevant threshold values and contributed their articles to the literature. Based on the related validation table, the scientific network (left) and density (right) map with scientists (n=27) and clusters (n=4) forming the largest inter-author link network (scientific collaboration) is presented in Figure 2 below.



*(The data can be seen more clearly and clearly when the relevant picture is zoomed in 250% and above).

Figure 2: Largest Inter-Author Scientific Network and Density Map

The scientific network and density map in Figure 2 were analysed with the aim of reaching the corresponding answers (C_6) in response to the question parameters (P_6) related to the research topic. In the examination of the scientific network and density map in Figure 2; both of the relevant maps reveal the relationship bond/content between

authors within the framework of co-authorship in the research subject. Although the analytical data such as clusters, number of authors, etc. are the same in the maps, it has been determined that there are 4 clusters, 27 authors and 102 scientific cooperation links in total. Based on this determination, it was determined that there are 9 authors in Cluster 1 (dark blue), 8 authors in Cluster 2 (green), 6 authors in Cluster 3 (red) and 4 authors in Cluster 4 (pink).

The twenty-year journey of industrial recreation research in the global perspective is explained below by examining the relevant scientific network (left) and density (right) map separately regarding the inter-author article, citation, total link strength values, scientific collaboration link (link) and scientific article study density within the framework of co-author. The scientific network map in Figure 2 (C_6):

- ✓ In the examination of the number of articles (documents); Li, H., Zhou, Y., Liu, I. and Xu, Z. were found to be in the 1st place with 2 articles. In addition, it has been determined that each other author in the relevant scientific network map has 1 scientific article. Considering these findings; in the last twenty-year journey (2005-2024) of scientific article studies in the focus of industrial recreation research topic in global perspective, it has been determined that the scientific article studies of Li, H., Zhou, Y., Liu, I. and Xu, Z. are more than other scientists.
- ✓ In the analysis based on the number of citations; Zhou, Y. ranked 1st with 127 citations, Li, H. ranked 2nd with 119 citations, Yang, S., Qu, Y., Wu, H., Liu, Q., Ma, J., An, Y. and Gong, Y. ranked 3rd with 117 citations. Considering these findings, it has been determined that in the last twenty-year journey (2005-2024) of scientific article studies in the focus of industrial recreation research in the global perspective, citations to Zhou, Y.'s scientific article studies are more than other scientists.
- ✓ In the analysis based on scientific collaboration (link); it was determined that Liu, I. ranked 1st with 16 links, Li, H. ranked 2nd with 14 links, and Xu, Z. ranked 3rd with 11 links. Considering these findings, it has been determined that the scientific cooperation (link) created by Liu, I., Li, H. and Xu, Z. in the last twenty-year journey (2005-2024) of scientific article studies in the focus of industrial recreation research topic in global perspective is more than other scientists.
- ✓ In terms of total link strength values; Liu, I. ranks 1st with a total of 16 link strength values, Li, H. ranks 2nd with a total of 14 link strength values, and Zhou, S. ranks 3rd with a total of 13 link strength values. Considering these determinations; in the last twenty-year journey (2005-2024) of scientific article studies in the focus of industrial recreation research topic in the global perspective, Liu, I., li, H., and Zhou, S., Z.'s total link strength values in the creation of scientific article studies were found to be higher than other scientists.
- ✓ When the inter-author density map (right) in the context of co-authors of scientific article studies on the twenty-year journey of industrial recreation research in global perspective is examined; Zhou, Y. between the 1st and 2nd cluster, Li, H. between the 2nd and 3rd cluster, Liu, I. between the 1st and 3rd cluster, and Xu, Z. between the 3rd and 4th cluster, it is seen that the red colour density in the area with the names of scientists is higher. Based on this determination; it has been determined that Zhou, Y., Li, H., Liu, I. and Xu, Z. scientists have contributed more to the literature in terms of

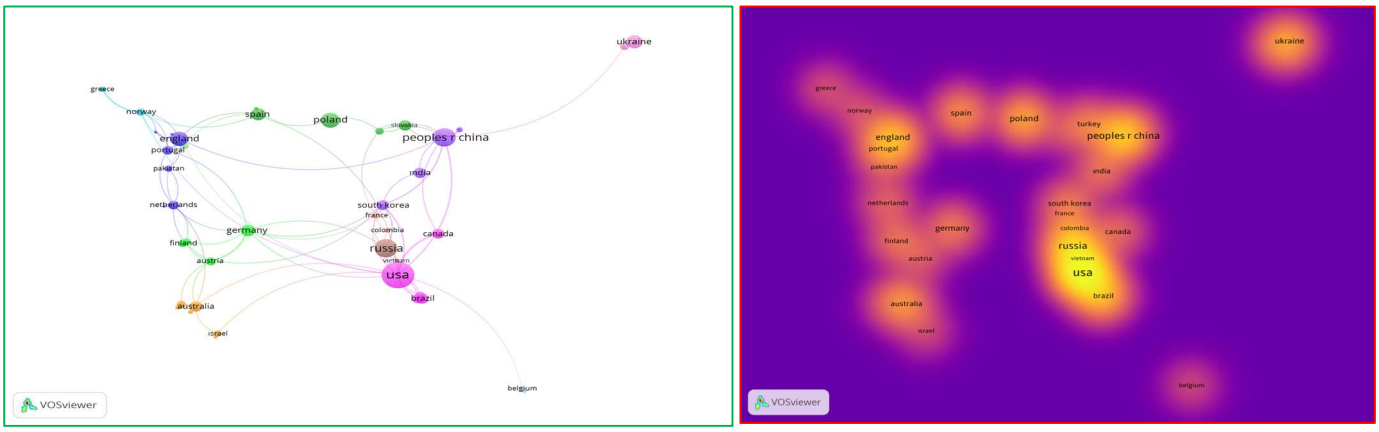
the number of articles in the last twenty-year journey (2005-2024) of scientific article studies focusing on industrial recreation research topic in global perspective.

Cross-Country Analysis within the Common Author Framework

Fast 5000 data file was introduced to the VOSviewer Statistical Analysis Programme to be tested in order to reveal the twenty-year journey of the researches (articles) on the subject of "industrial recreation" in the global perspective and the social structures between countries within the framework of the co-author. The relevant data file was selected by determining the threshold values in the analysis programme base in order to determine the number of articles and citations and total link strength values between countries within the framework of co-author. In this context, the threshold values determined can be stated as follows:

- ✓ Type of Analysis: Co-author,
- ✓ Analysis Unit: Countries,
- ✓ Counting Method : Full Count and
- ✓ Minimum number of articles for a country: 1
- ✓ Minimum number of citations for a country: 1

Within the framework of the threshold values mentioned above, the relevant data file was tested and it was determined that 67 countries out of 73 countries met the selected threshold values. Verification table (Verif selected countries) data output was obtained, which includes the number of scientific articles, citations and total link strength (scientific collaboration) values of 67 countries that meet the relevant threshold values and are related to the inclusion of articles in the literature on research. Based on the related validation table, the scientific network (left) and density (right) map with the countries (n=67) and clusters (n=12) that constitute the largest network (scientific cooperation) between countries is presented in Figure 3 below.



*(The data can be seen more clearly and clearly when the relevant picture is zoomed in 250% and above).

Figure 3: Map of the Largest Scientific Network and Density Across Countries

The scientific network and density map in Figure 3 were analysed in order to reach the corresponding answers (C_7) in response to the question parameters (P_7) related to the research topic. In the analysis of the scientific network and density map in Figure 3; both of the relevant maps reveal the relationship link/content between countries in the field of research within the framework of a common author. Although the analytical data such as the number of clusters, countries, etc. Are the same in the maps, it has been determined that there are 12 clusters and 51 countries in total. Based on this

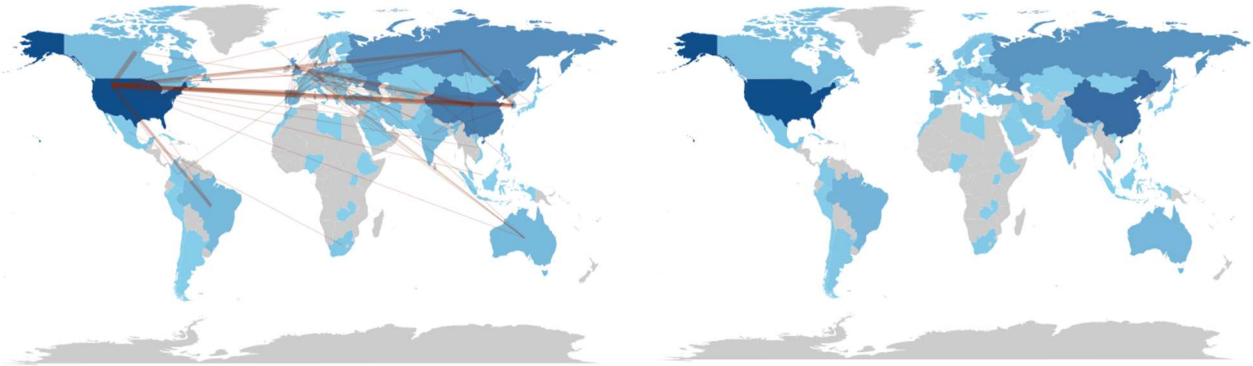
determination, cluster 1 (navy blue) has 7 countries, cluster 2 (green) has 7 countries, cluster 3 (orange) has 6 countries, cluster 4 (pink) has 6 countries, cluster 5 (purple) has 5 countries, cluster 6 (turquoise blue) has 4 countries, cluster 7 (turquoise green) has 4 countries, cluster 8 (brown) has 3 countries, and cluster 8 (brown) has 3 countries. Cluster (brown) 3, cluster 9 (dark pink) 3, cluster 10 (light orange) 2, cluster 11 (light green) 2 and cluster 12 (grey) 2 countries. In addition, 91 scientific collaboration links and 103 total link strength values were determined from the relevant scientific network map.

The twenty-year journey of industrial recreation research in the global perspective is explained below by examining the relevant scientific network (left) and density (right) maps separately regarding the article, citation, total link strength values, scientific collaboration link (link) and scientific article study density between countries within the framework of the co-author. The scientific network map in Figure 3 (C_7):

- ✓ In the examination of the number of articles (documents); It was determined that USA ranked 1st with 69 articles, RUSSIA and PEOPLES R CHINA ranked 2nd with 33 articles, and POLAND ranked 3rd with 22 articles. In addition, it has been determined that each other country in the relevant scientific network map is associated with different numbers of scientific article studies reflected in the literature. Considering these findings, it has been determined that USA, RUSSIA, PEOPLES R CHINA and POLAND are more related to the publication of scientific article studies in the last twenty years (2005-2024) in the last twenty years of scientific article studies in the focus of industrial recreation research in the global perspective.
- ✓ In the examination based on the number of citations; USA ranks 1st with 1483 citations, PEOPLES R CHINA ranks 2nd with 909 citations and SPAIN ranks 3rd with 382 citations. Considering these findings, it has been determined that in the last twenty-year journey (2005-2024) of scientific article studies in the focus of industrial recreation research topic in the global perspective, citations to scientific article studies related to USA, PEOPLES R CHINA and SPAIN are more than other world countries.
- ✓ In the examination based on scientific cooperation (link); USA ranks 1st with 18 links, PEOPLES R CHINA ranks 2nd with 11 links and NORWAY ranks 3rd with 9 links. Considering these findings, it has been determined that the scientific cooperation (link) created by USA, PEOPLES R CHINA and NORWAY in the last twenty-year journey (2005-2024) of scientific article studies in the focus of industrial recreation research in the global perspective is more than other countries.
- ✓ When analysed in terms of total link strength values, it was determined that USA ranked 1st with a total of 26 link strength values, PEOPLES R CHINA ranked 2nd with a total of 13 link strength values, SOUTH KOREA and GERMANY ranked 3rd with a total of 10 link strength values. Considering these findings; in the last twenty-year journey (2005-2024) of scientific article studies in the focus of industrial recreation research topic in the global perspective, it has been determined that the total link strength values of USA, PEOPLES R CHINA SOUTH KOREA and GERMANY in the context of scientific cooperation with other countries in the creation of scientific article studies are higher than other countries.

- ✓ When the inter-country density map (right) in the context of the countries in which scientific article studies on the twenty-year journey of industrial recreation research in the global perspective are included in the literature is examined; USA, RUSSIA, PEOPLES R CHINA, SPAIN, GERMANY, POLAND, UKRAINE, ENGLAND, AUSTRALIA country names in the area where the yellow colour density is higher. Based on this determination; in the last twenty-year journey (2005-2024) of scientific article studies focusing on industrial recreation research topic in a global perspective, it has been determined that USA, RUSSIA, PEOPLES R CHINA, UKRAINE, ENGLAND and AUSTRALIA countries have contributed more to the literature in terms of the number of articles related to them.

The BibTex data file was tested by introducing it to the relevant analysis programme in order to reveal the relationship between scientific intensity and scientific cooperation in the twenty-year journey of the leading (top 10) countries in research (articles) on "industrial recreation" in the global perspective. As a result of the test; the world map indicating the intensity (right) and scientific collaboration (left) of research (articles) in the context of countries is presented below in Figure 4.



*(When the relevant picture is zoomed in by 250% and above, the scientific link to the data and the country locations can be understood more clearly).

Figure 4: Cross-Country Scientific Network and Density Map

Considering the 2 or more scientific cooperation links of the countries on the world map of scientific cooperation between countries presented in Figure 4 (left), it has been determined that the United States of America has 4 scientific cooperation networks with Canada, 3 with China, 2 with Brazil, France, Korea and Russia, 1 with other countries, Russia has 2 with Korea, 1 with other countries, Germany has 3 with Austria, 1 with other countries, China has 2 with England and Korea and 1 with other countries. In this context, it has been determined that the United States of America is the country with more scientific cooperation networks than other countries in bringing scientific article studies related to its twenty-year journey in the global perspective to the international literature in the focus of "industrial recreation" research topic.

In the examination made on the scientific intensity world map (right) presented in Figure 4; it has been determined that the United States of America has 200, China 148, Russia 86, Poland and England 51, Ukraine 49, Brazil 38, Spain 35, Australia 34 and India 31 scientific articles in the focus of "industrial recreation" research topic in its twenty-

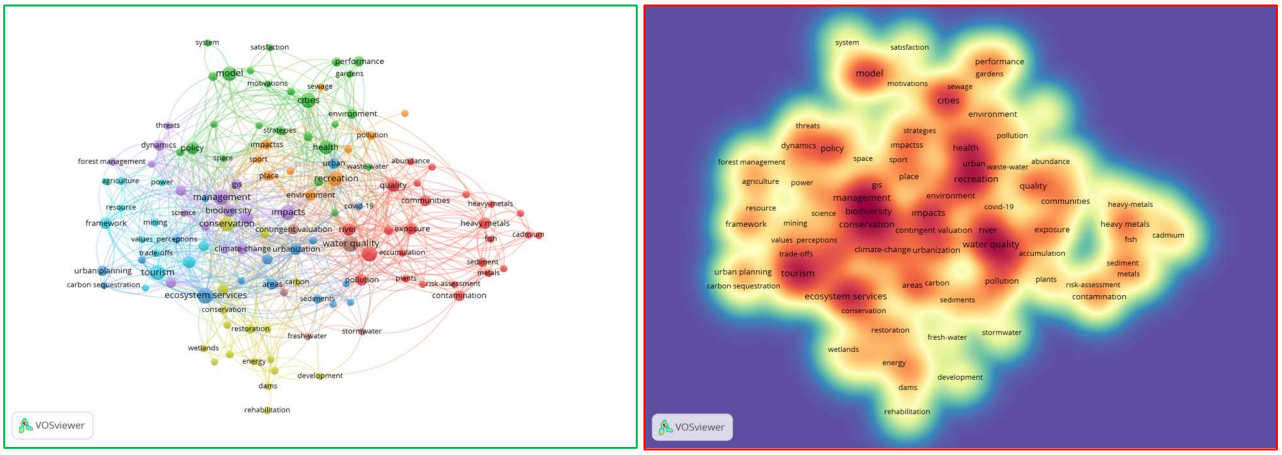
year journey in the global perspective. Considering these findings, it has been determined that the relevant countries ranked in the top ten (10) in the global perspective contribute/support more to the international literature in the reflection of scientific articles on the research topic.

Inter-Keyword Analysis within the Common Word Framework

In order to reveal the twenty-year journey of the researches (articles) on "industrial recreation" in the global perspective; the conceptual structures between keywords within the framework of the common word, the RIS data file was introduced to the VOSviewer Statistical Analysis Programme for testing. The relevant data file was selected by determining the threshold values in the analysis programme base in order to determine the usage and total connection power values between keywords within the common word framework. In this context, the threshold values determined can be stated as follows:

- ✓ Type of Analysis: Common word,
- ✓ Analysis Unit: Keyword,
- ✓ Counting Method: Full Count and
- ✓ Minimum number of uses of a keyword: 3

Within the framework of the threshold values mentioned above, the relevant data file was tested and it was determined that 125 keywords out of 2389 keywords met the selected threshold values. Verification table (Verif selected Keyword) data output was obtained, which includes the number of uses in scientific articles and total link strength (scientific collaboration) values of 125 keywords that meet the relevant threshold values and are included in the article studies on the research topic. Based on the related validation table, the scientific network (left) and density (right) map with keywords (n=125) and clusters (n=8) forming the largest connection network (scientific collaboration) between keywords is presented in Figure 5 below.



*(The data can be seen more clearly and clearly when the relevant picture is zoomed in 250% and above).

Figure 5: Largest Scientific Network between Keywords and Density Map

The scientific network and density map in Figure 5 were analysed in order to reach the answers (C_8) corresponding to the question parameters (P_8) related to the research topic. In the analysis made on the scientific network and density map in Figure 5; both of the relevant maps reveal the relationship link/content between keywords in the research topic within the framework of common use. Although the analytical data such

as cluster, number of keywords, etc. Are the same in the maps, it was determined that there are 8 clusters and 125 keywords in total. Based on this determination, it was determined that cluster 1 (red) 25, cluster 2 (green) 24, cluster 3 (dark blue) 17, cluster 4 (yellow) 17, cluster 5 (purple) 15, cluster 6 (turquoise blue) 12, cluster 7 (orange) 10, cluster 8 (brown) 5 keywords. In addition, from the relevant scientific network map, it was determined that there were 813 scientific collaboration links and a total link strength value of 937.

The twenty-year journey of industrial recreation research in the global perspective is explained below by examining the related scientific network (left) and density (right) maps separately regarding the common usage between keywords, total link strength values, scientific collaboration link (link) and keyword density in scientific article studies. The scientific network map in Figure 5 (C_8):

- ✓ In the examination of the number of common keyword usage (Occurrences); "ecosystem services", "water quality" ranks 1st with 15 common occurrences, "management", "recreation", "recreation", "tourism" ranks 2nd with 14 common occurrences, "water", "impacts" ranks 3rd with 13 common occurrences, "conservation", "model" ranks 4th with 12 common occurrences, "health" ranks 5th with 11 common occurrences. In addition, it was determined that each other keyword in the relevant scientific network map was used in different numbers in scientific article studies and the relevant articles were transferred to the literature. Considering these findings, it has been determined that the common use of "ecosystem services", "water quality", "management", "recreation", "tourism", "water", "impacts", "conservation", "model" and "health" in scientific article studies is higher than other keywords.
- ✓ In the analysis of the number of common use (link) links of keywords; "ecosystem services" ranks 1st with 40 common use links, "water" ranks 2nd with 37 common use links, "recreation", "management" ranks 3rd with 33 common use links, "ctıes" ranks 4th with 31 common use links, "conservation", "clımate-change" ranks 5th with 28 common use links. Considering these findings, it has been determined that in the last twenty-year journey (2005-2024) of scientific article studies focusing on the research topic of industrial recreation in the global perspective, it has been determined that the bond relationship due to the common use of "ecosystem services", "water", "recreation", "management", "cıtıes", "conservation", "clımate-change" in scientific article studies is more than other keywords.
- ✓ In the analysis made in terms of total link strength values of keywords; "ecosystem services" ranks 1st with a total link strength value of 57, "management", "Water" ranks 2nd with a total link strength value of 47, "recreation" ranks 3rd with a total link strength value of 42, "ctıes" ranks 4th with a total link strength value of 39, "conservation" ranks 5th with a total link strength value of 38. When these findings are taken into consideration; it has been determined that the total link power value created by the scientific article studies focusing on the research topic of industrial recreation in the global perspective in the last twenty years (2005-2024) regarding the common use of "ecosystem services", "management", "water", "recreation", "cıtıes" and "conservation" in scientific article studies is higher than other keywords.

- ✓ When the intensity map (right) is analysed in the context of the common use of keywords in the literature of scientific articles on the twenty-year journey of industrial recreation research in a global perspective; "management", "biodiversity", "conservation", "climate change", "urbanization", "impacts", "tourism", "ecosystem services", "water", "rıver", "exposure", "recreation", "urban", "health" and "cıtıes", it is seen that the red colour intensity is higher in the area where the keywords are located. Based on this determination; In the last twenty-year journey (2005-2024) of scientific article studies focusing on industrial recreation research topic in global perspective, "management", "biodiversity", "conservation", "climate change", "urbanisation", "impacts", "tourism", "ecosystem services", It has been determined that the number of use of the keywords "water", "rıver", "exposure", "recreation", "urban", "health" and "cıtıes" is higher and the article studies are handled and examined within the scope of the relevant keywords and reflected in the literature.

Discussion and Conclusion

The transformation of post-industrial landscapes into recreational spaces represents one of the most significant trends in contemporary urban planning and sustainable development. As cities worldwide grapple with the legacy of deindustrialization—abandoned factories, contaminated brownfields, and derelict infrastructure—the potential to convert these spaces into vibrant public amenities has garnered increasing scholarly attention. This study conducted a comprehensive bibliometric analysis to examine the twenty-year journey (2005-2024) of research on industrial recreation, revealing performance indicators, social structures, and conceptual frameworks that characterize this interdisciplinary field. The findings and conclusions based on the tests and analyses conducted on the relevant data can be explained as follows.

As a result of the tests and analyses carried out to reveal the twenty-year (2005-2024) journey of post-industrial landscape transformation research studies (articles, papers, books, etc.) in a global perspective within the framework of publication languages: It was determined that the most scientific studies on the research subject were brought to the literature in "English" and the least in "Croatian", "French", "German" and "Italian" (Table 1). When this determination is taken into consideration, it is evaluated that "English" will continue to be the leader in the reflection of scientific studies on the research topic to the literature. It is interpreted that the fact that scientific studies in the focus of the research subject are published more in the "English" language and brought to the international literature, that it is a global language, that education and training is provided in "English" language in many universities and that scientific journals continue their publication life in "English" language have an important share. In addition, it can be stated that "English" is a language that is used, preferred and accepted more in many fields (education, training, business, industry sector, international relations, economy, etc.) in a global perspective. In this context, it is thought that scientists who intend to bring scientific studies on the relevant research topic to the literature may provide more contribution / benefit to them by taking more into account the scientific studies brought to the international literature in the "English" publication language.

As a result of the tests and analyses carried out to reveal the twenty-year (2005-2024) journey of articles focused on post-industrial landscape transformation research in a global perspective within the framework of publication years: It has been determined that scientific article studies on the research subject have followed an up and down path in terms of publication years, and the highest number of articles were published in "2023" and the lowest number in "2006" (Table 2). However, although scientific article studies follow an up and down path, it is noteworthy that scientific article studies follow an increasing trend compared to the previous and subsequent years. Based on these findings; it is evaluated that scientists have brought scientific studies to the literature in order to draw attention to the importance of post-industrial landscape transformation research subject in terms of sustainable urban development, environmental remediation, and public space creation. In this context, it is thought that scientists want to emphasise how important the research topic is for urban planners, environmental scientists, and policymakers seeking innovative solutions for brownfield redevelopment.

As a result of the tests and analyses carried out to reveal the twenty-year (2005-2024) journey of articles focused on post-industrial landscape transformation research in a global perspective within the framework of research areas: "Environmental Sciences-Ecology", "Communication", "Construction-Building Technology", "Developmental Biology", "Education-Educational Research", "Energy Fuels", "Film Radio Television", "Imaging Science-Photo Technology", "Information Science-Library Science", "Philosophy of History Science", "Instruments-Instrumentation", "Mineralogy", "Operations Research Management Science", "Philosophy", "Rehabilitation", "Social Issues", "Social Services", "Sports Sciences", "Veterinary Sciences" and "Zoology" (Table 3). When these findings are taken into consideration, it is evaluated that the subject of the research is more related to the research topic of "Environmental Sciences-Ecology", reflecting the inherent connection between brownfield remediation, ecosystem restoration, and the creation of green infrastructure on former industrial sites. On the other hand, it is interpreted that scientists have gained a large number of scientific articles in the international literature in order to draw attention to the importance of post-industrial landscape transformation in the global perspective in terms of environmental sustainability, biodiversity conservation, and ecosystem services provision. In addition, it is thought that in terms of "Environmental Sciences-Ecology", researchers seek to demonstrate how the strategic conversion of abandoned industrial areas into recreational green spaces can contribute to urban ecological networks, climate change adaptation, and the overall enhancement of environmental quality in urbanized regions.

As a result of the tests and analyses carried out to reveal the twenty-year (2005-2024) journey of articles focused on post-industrial landscape transformation research in a global perspective within the framework of the indexes in which the journals in which they are published are indexed: It has been determined that scientific articles on the research topic are reflected in the international literature in scientific journals indexed in the "Science Citation Index Expanded (SCI-EXPANDED)" and in the Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH) field index (Table 4). Considering these findings; it is evaluated that scientific articles on research are

mostly handled in the field of environmental sciences and engineering. In addition, when the scientific article studies published in the "Emerging Sources Citation Index (ESCI)" and "Social Sciences Citation Index (SSCI)" field indexes are taken into consideration, it is noteworthy that a significant number of scientific article studies have been included in the international literature in scientific journals indexed in the relevant field index. In this context, it is interpreted that the research topic of post-industrial landscape transformation has been significantly addressed and analysed across multiple disciplines, reflecting its inherently interdisciplinary nature.

As a result of the tests and analyses carried out to reveal the twenty-year (2005-2024) journey of articles focused on the research topic of post-industrial landscape transformation in a global perspective within the framework of citations: Tu (2011), the most cited researcher on the research topic in a global perspective, published in the scientific journal "Applied Geography" with the title "Spatially varying relationships between land use and water quality across an urbanisation gradient explored by geographically weighted regression", associated with the doi address "10.1016/j.apgeog.2010.08.001" (Table 5). In addition, Li et al., (2016)'s "Spatio-temporal assessment of urbanisation impacts on ecosystem services: Case study of Nanjing City, China", associated with the doi address "10.1016/j.ecolind.2016.07.017" and published in the scientific journal "Ecological Indicators" has been found to be remarkably cited. These highly cited works reflect the field's strong emphasis on understanding the environmental dimensions of land use change and ecosystem services—themes central to post-industrial landscape transformation research. At the same time, when the publication years of the other scientific studies in Table 5 are taken into consideration, it is evaluated that they will receive more citations in the following years and may replace the other scientific studies in the first two places. It is interpreted that scientists who intend to conduct a scientific study on the subject of research will contribute more to themselves and the literature if they benefit from the scientific studies presented in the relevant table.

As a result of the tests and analyses carried out to reveal the social structure of the articles focused on the research topic of post-industrial landscape transformation in the global perspective for twenty years (2005-2024) in the context of co-authorship: "Li, H.", "Zhou, Y.", "Liu, I." and "Xu, Z." have the highest number of scientific articles, "Zhou, Y." has the highest number of citations, "Liu, I." has the highest number of scientific collaborations (links) and "Liu, I." has the highest scientific link power value in total (Figure 2). Based on these findings, it is evaluated that scientists who want to make a scientific study on the research topic and bring it to the literature should examine the scientific studies of the relevant scientists on the research topic, which will provide important support and contribution to their research. These leading authors have contributed significantly to understanding the ecological dimensions of landscape transformation, particularly in relation to ecosystem services assessment and urban environmental quality.

As a result of the tests and analyses carried out to reveal the social structure of the articles focused on the research topic of post-industrial landscape transformation in the global perspective for twenty years (2005-2024) in the context of co-authorship: It has

been determined that "USA" has the highest number of scientific article studies, citations, scientific cooperation (link) and total scientific link power value in the global perspective (Figure 3 and 4). The prominence of the USA in this field can be attributed to its extensive history of deindustrialization, significant brownfield inventory, and well-established funding mechanisms for urban regeneration research. Based on these findings, it is evaluated that international research collaborations, particularly those involving leading countries such as USA, China, and European nations, can accelerate knowledge transfer and promote best practices in post-industrial landscape transformation worldwide.

As a result of the tests and analyses carried out to reveal the conceptual structure of the articles focused on the research topic of post-industrial landscape transformation in the global perspective for twenty years (2005-2024) in the context of common words between keywords: "ecosystem services", "water quality", "management", "recreation", "tourism", "water", "impacts", "conservation", "model" and "health" keywords were found to be used more in scientific article studies in global perspective. These keywords reflect the multidimensional nature of post-industrial landscape research, encompassing environmental remediation (water quality), ecological benefits (ecosystem services, conservation, biodiversity), planning approaches (management, model), and human well-being outcomes (health, recreation, tourism). According to these findings; it is evaluated that future research opportunities exist in exploring underrepresented themes such as community engagement, cultural heritage preservation, climate adaptation, and social equity dimensions of post-industrial landscape transformation.

Many tests and analyses were carried out on post-industrial landscape transformation research and conclusions were reached based on the findings. Considering the findings and results, it was thought that some suggestions could be made to scientists, universities/institutions and relevant stakeholders involved in urban regeneration and environmental planning. Based on this idea, the following suggestions can be made:

Recommendations for Scientists/Researchers;

- ✓ Conducting scientific studies (articles, books, proceedings, book chapters, etc.) in the field of research outside the "English" publishing language and bringing them into the literature,
- ✓ Since scientific articles on research have a remarkable tendency to decrease in the relevant years, scientific studies on research should be carried out and transferred to the literature,
- ✓ Carrying out scientific article studies in research areas other than "Environmental Sciences-Ecology" research area (Table 3: I_2-I_{54})
- ✓ Ensuring that scientific articles are published in journals other than those indexed in "SCI-EXPANDED", "ESCI" and "SSCI" index,
- ✓ Benefiting from the articles of scientists presented in Table 5 in conducting scientific studies related to the research topic,
- ✓ To examine and take into account the articles of "Li, H.", "Zhou, Y.", "Liu, I." and "Xu, Z." scientists in bringing their scientific studies to the literature in the focus of the relevant research topic,

- ✓ Conducting scientific studies on post-industrial landscape transformation research topic exploring underrepresented themes such as community participation, cultural heritage preservation, social equity, climate adaptation strategies, and long-term monitoring of ecological outcomes

Recommendations for Related Universities/Institutions;

✓ Universities and countries that will carry out scientific studies on the subject of research and the countries that will support them to consider and examine the scientific studies of USA, RUSSIA, PEOPLES R CHINA, UKRAINE, ENGLAND and AUSTRALIA countries on the subject of research,

✓ Scientific co-operation between the relevant countries and other countries that are prominent in the field of research and the scientific cooperation of important scientific studies, projects, papers, congresses, etc. Scientific studies,

✓ Establishing interdisciplinary research centers and programs focusing on post-industrial landscape transformation, bringing together expertise from urban planning, environmental science, landscape architecture, and public health,

✓ Developing comprehensive case study databases and best practice guidelines for post-industrial landscape transformation projects, drawing particularly from successful initiatives in leading countries such as USA, Germany, and China,

Recommendations for Urban Planners and Policymakers;

✓ Integrating post-industrial landscape transformation strategies into urban master plans and regional development frameworks, with particular attention to brownfield inventories and prioritization criteria for remediation and redevelopment,

✓ Establishing funding mechanisms and incentive programs to encourage public-private partnerships in the transformation of abandoned industrial sites into multifunctional recreational spaces,

✓ Implementing long-term monitoring programs to assess the environmental, social, and economic outcomes of post-industrial landscape transformation projects, enabling evidence-based policy refinement,

✓ Promoting community engagement and participatory planning approaches in post-industrial landscape transformation projects to ensure that redeveloped spaces meet local needs and foster social cohesion.

Considering the growing importance of post-industrial landscape transformation for sustainable urban development, environmental remediation, and public health, this bibliometric analysis reveals that significant research opportunities remain in various underexplored areas (Table 3: I_2-I_{54}). The performance and scientific mapping analyses conducted in this study demonstrate both the achievements and gaps in the current body of knowledge. Based on these findings, the main recommendation of this study is to encourage continued interdisciplinary research that bridges environmental science, urban planning, landscape architecture, and social sciences to advance our understanding of how former industrial sites can be most effectively transformed into sustainable recreational landscapes. Such research will benefit urban planners, policymakers, environmental scientists, landscape architects, and communities worldwide as they seek evidence-based approaches to brownfield redevelopment and urban regeneration.

Kısaltmalar / Abbreviations

WoS	Web of Science
SCI-EXPANDED	Science Citation Index Expanded
ESCI Emerging	Sources Citation Index
SSCI	Social Sciences Citation Index
A&HCI	Arts & Humanities Citation Index
BKCI-S	Book Citation Index-Science
BKCI-SSH	Book Citation Index-Social Sciences & Humanities
CPCI-S	Conference Proceedings Citation Index-Science
CPCI-SSH	Conference Proceedings Citation Index-Social Science & Humanities
USA / ABD	United States of America
PRC	People's Republic of China
RIS / BibTex	Bibliometric data file formats
Sn	Sequence Number
n	Number of studies or citations

Beyanlar / Declarations

Ethics approval and consent to participate

Bu çalışmanın hazırlanma ve yazım sürecinde "Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi" kapsamında bilimsel, etik ve alıntı kurallarına uyulmuş olup; toplanan veriler üzerinde herhangi bir tahrifat yapılmamış ve bu çalışma herhangi başka bir akademik yayın ortamına değerlendirme için gönderilmemiştir. Makale ile ilgili doğabilecek her türlü ihlallerde sorumluluk yazara aittir.

During the preparation and writing of this study, all scientific, ethical, and citation standards set forth in the Higher Education Institutions Scientific Research and Publication Ethics Guidelines were strictly observed. No manipulation or alteration was made to the collected data, and this study has not been submitted to any other academic publication venue for evaluation. The author assumes full responsibility for any potential violations that may arise in connection with this article.

Veri Ve Materyal Erişilebilirliği / Availability of data and material

The data that support the findings of this study are available from the corresponding author upon reasonable request. The dataset will be accessible only for academic purposes, and any use of the data will recognize the original study and maintain the confdentiality of the participants.

Yazar Katkıları / Authors' Contribution Statement

Çalışmanın tasarımı ve planlanması: A.C., M.P.; Veri toplama, analizi veya yorumlanması: A.C., M.P.; Makalenin hazırlanması: A.C., M.P.; Verilerin düzenlenmesi, yöntem geliştirme, yazım – özgün taslak, yazım – gözden geçirme ve düzenleme: A.C., M.P.; Tüm yazarlar makalenin önemli noktalarını eleştirel olarak gözden geçirmiş ve son halini onaylamıştır.

Design and planning of the study: A.C., M.P.; Data collection, analysis or interpretation: A.C., M.P.; Manuscript preparation: A.C., M.P.; Data organization, methodology development, writing - original draft, writing – review and editing: A.C., M.P.; All authors critically reviewed the key points of the manuscript and approved the final version.

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