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How Responsive Are Indian Geographers to the Sustainable Development Goals? Evidence from Scopus-Indexed Research

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Abstract

The Sustainable Development Goals (SDGs), adopted under the United Nations 2030 Agenda for Sustainable Development, provide a global framework for addressing sustainability challenges, with geography playing an important role through its spatial perspective. This study examines SDG engagement within Indian research in Geography, Planning and Development (Scopus Subject Code 3305) during 2015–2025. Using the Scopus database, 19,181 English-language journal articles were analysed, of which 6,410 (33.4%) were identified as SDG-related through abstract-based classification in Biblium. Bibliometric methods were applied using ScientoPy, Orange, and VOSviewer to assess publication trends, SDG distribution, thematic evolution, collaboration networks, and citation impact. The findings reveal a strong concentration of research on environmentally and spatially oriented goals, particularly Life on Land (SDG 15), Sustainable Cities and Communities (SDG 11), Good Health and Well-being (SDG 3), No Poverty (SDG 1), and Zero Hunger (SDG 2). In contrast, Gender Equality (SDG 5), Reduced Inequalities (SDG 10), and Industry, Innovation and Infrastructure (SDG 9) received comparatively limited attention. Topic modelling identified urbanisation, land-use change, climate, and water resources as dominant themes, supported largely by remote sensing, GIS, and spatial modelling. Sustainability emerged as the fastest-growing theme, while machine learning showed the highest relative growth. International collaboration was strongest with the United States, the United Kingdom, and Saudi Arabia. Overall, Indian geographical research contributes substantially to sustainable development but remains less engaged with social, institutional, and governance-related SDGs, highlighting opportunities to strengthen geography's contribution to the 2030 Agenda.

Keywords: Text analysis; Urban planning; Biblium; PyBibX; Remote sensing; Citations; Geography

1. Introduction

The Sustainable Development Goals (SDGs) represent one of the most ambitious and transformative global development frameworks formulated to address the multifaceted challenges confronting humanity in the twenty-first century. Adopted unanimously by the member states of the United Nations (UN) in September 2015 under the 2030 Agenda for Sustainable Development, the SDGs comprise 17 interconnected goals and 169 targets and 232 progress indicators designed to foster inclusive economic growth, environmental sustainability, social equity, and institutional resilience (United Nations, 2015)¹. The framework seeks to eradicate poverty and hunger, reduce inequalities, ensure quality education and health, foster sustainable urbanization, mitigate climate change, and conserve natural ecosystems through integrated and participatory approaches. Unlike earlier development paradigms that often-emphasized economic growth in isolation, the SDGs recognize the interdependence of ecological integrity, economic prosperity, and social justice while emphasizing the overarching principle of “Leaving No One Behind”, thereby ensuring that development benefits all sections of society, particularly marginalized and vulnerable populations².

The conceptual foundation of the SDGs evolved through decades of global sustainability discourse. A critical milestone was the United Nations Conference on the Human Environment (Stockholm Conference, 1972)³, which formally introduced environmental concerns into international development debates and emphasized the need to integrate ecological considerations into economic planning. Subsequently, the Brundtland Commission Report (1987) conceptualized sustainable development as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*,” thereby laying the theoretical foundation for balancing economic progress with environmental protection and intergenerational equity⁴. The Rio Earth Summit (1992) further institutionalized sustainability through Agenda 21, emphasizing integrated resource management, participatory governance, and international cooperation. These developments eventually culminated in the Millennium

¹ <https://www.undp.org/sustainable-development-goals>

² https://www.undp.org/sites/g/files/zskgke326/files/2024-02/ihr_undp_publikacija.pdf

³ <https://www.un.org/en/conferences/environment/stockholm1972>

⁴ <https://www.are.admin.ch/en/1987-brundtland-report>

Development Goals (MDGs) in 2000, which focused primarily on poverty alleviation, education, maternal health, disease reduction, and basic human welfare⁵.

Despite measurable achievements under the MDGs, scholars and policymakers increasingly criticized the framework for its narrow developmental orientation, fragmented implementation mechanisms, limited environmental emphasis, and insufficient attention to structural inequalities and institutional transformation. In response to these limitations, the SDGs emerged as a broader, universal, and multidimensional framework applicable to both developed and developing nations. Unlike the MDGs, which predominantly focused on developing economies, the SDGs require collective responsibility and cross-sectoral participation among governments, civil society, academia, industries, and local communities. However, despite considerable policy commitments, global progress toward the achievement of SDGs remains uneven and insufficient. Contemporary assessments indicate that progress across numerous SDG indicators has slowed due to climate crises, economic instability, geopolitical conflicts, financial constraints, and governance challenges, thereby necessitating accelerated implementation and stronger interdisciplinary interventions (Saxena et al., 2021).

In this regard, Geography, Planning, and Development Studies emerge as highly relevant disciplines in understanding and advancing SDG-oriented research and implementation. Geography, often regarded as an integrating discipline, bridges natural and social sciences and provides a holistic understanding of the complex interactions between humans and environments. It facilitates the examination of spatial inequalities, environmental degradation, urbanization, regional development, climate vulnerability, land-use transformation, and resource accessibility, all of which constitute core dimensions of sustainable development. Geography therefore plays a crucial role in identifying spatial disparities and supporting place-based policy interventions required for achieving sustainability goals. Similarly, planning studies contribute significantly to sustainable development through land-use planning, infrastructure provision, urban resilience, environmental governance, transportation planning, and sustainable city development, particularly aligned with SDG 11 (Sustainable Cities and Communities). Development studies further complement these efforts by addressing issues of poverty, governance, socio-economic inequalities, livelihoods, and institutional transformation (Meadows, 2020). Recent scholarship increasingly emphasizes that geography possesses a unique interdisciplinary advantage in addressing SDGs because nearly all sustainability challenges have an inherent spatial dimension. From poverty and food insecurity to climate change and urban sustainability, geographical perspectives enable researchers to investigate patterns, processes, and territorial inequalities across multiple scales (González & Sebastián-López, 2022). Geography has therefore been identified as one of the most effective disciplines for promoting sustainability education, spatial awareness, and evidence-based policy interventions due to its ability to integrate environmental, economic, political, and socio-cultural dimensions of development. Moreover, geographers are increasingly recognized as essential contributors to achieving SDGs because of their ability to bridge science and policy, generate spatially explicit evidence, and facilitate integrated approaches for sustainable development (La Torre et al., 2019; Manakane et al., 2023; Ni et al., 2025a; Pereira & Zhao, 2025a).

The relevance of the SDGs is particularly significant in the Indian context, considering the country's demographic complexity, socio-economic diversity, rapid urbanization, and environmental vulnerabilities. As one of the world's fastest-growing economies and most populous nations, India faces persistent developmental challenges including regional disparities, environmental degradation, urban sprawl, climate risks, food insecurity, water scarcity, unemployment, and unequal access to resources and opportunities. Recognizing these challenges, India has incorporated SDGs into national and regional policy frameworks through initiatives such as the NITI Aayog SDG Index, state-level sustainability monitoring systems, and localized implementation strategies. Consequently, SDG-related research within Indian academia has expanded substantially, particularly within the disciplines of Geography, Planning, and Development Studies (A. Singh, Kanaujia, & Singh, 2022). Existing scholarship increasingly focuses on urban sustainability, land use and land cover (LULC) change (A. U. D. Waza et al., 2023; A. u D. Waza et al.,

⁵ <https://www.un.org/millenniumgoals/>

2026), climate resilience(Dar et al., 2026), environmental governance(Mohanty et al., 2025), disaster management (Ansari et al., 2024), peri-urbanization(Din Waza et al., 2026), rural transformation(Suresha et al., 2025), sustainable livelihoods(Pallayil et al., 2024), and regional development(Sharma & Sinha, 2023).

Despite this increasing scholarly engagement, a systematic understanding of the intellectual structure, thematic evolution, publication patterns, and collaborative networks of SDG-related research in Indian Geography, Planning, and Development domains remains limited. Existing investigations often focus on policy implementation or sector-specific analyses, whereas relatively fewer studies comprehensively examine the broader scientific landscape of SDG scholarship. Bibliometric and scientometric approaches provide robust methodological tools for understanding patterns of scientific production, thematic concentrations, citation structures, institutional productivity, influential contributors, and emerging research frontiers. Such analyses are particularly important for identifying knowledge gaps, understanding disciplinary trajectories, and evaluating the extent to which Indian research aligns with national sustainability priorities and global development commitments.

Against this backdrop, the present study seeks to systematically examine “SDGs in Indian Geography, Planning and Development Research Indexed in Scopus” by analyzing publication trends, thematic concentrations, collaboration networks, influential authors, institutional productivity, and emerging areas of research. Through a comprehensive bibliometric perspective, the study aims to provide deeper insights into India’s scholarly engagement with sustainable development discourse while contributing valuable evidence for researchers, planners, and policymakers striving to strengthen SDG-oriented research and evidence-based pathways toward achieving the 2030 Sustainable Development Agenda.

Note: Throughout this study, the term “geography” is used as a shorthand reference to the broader Scopus subject area “*Geography, Planning and Development*” (Subject Code: 3305). Unless otherwise specified, all references to geography should be interpreted as referring to this entire subject field.

2. Review of Literature

Bibliometric/scientometric studies on SDG’s

Several studies have examined the Sustainable Development Goals (SDGs) using metric approaches such as bibliometrics and scientometrics across different fields, including psychology (Bulut & Çağlar, 2025), higher education (Osman et al., 2025), and the COVID-19 pandemic (Wang & Huang, 2021). Bibliometric and scientometric methods are widely used to characterize scientific literature by quantifying scientific output, scholarly communication, and research policy. These approaches are among the most widely recognized metric procedures for the quantitative assessment of science (B. A. Malik et al., 2021; Milojević & Leydesdorff, 2013). Furthermore, they facilitate the evaluation of research impact from multiple perspectives (B. A. Malik et al., 2019).

Several recent studies in the geographical sciences have employed bibliometric and scientometric techniques to assess SDG-related publications using databases such as the Web of Science (WoS) and Scopus. For example, (Ferreira & Valdati, 2023) reviewed publications on *geoparks* in the context of the SDGs using the Scopus database, focusing on themes such as geotourism, geoconservation, and education. Similarly, (Bian et al., 2025) conducted a review using the WoS database to examine publications related to SDG 15.4, which aims to conserve and promote the sustainable use of mountain ecosystems. Their study highlighted that researchers and policymakers have widely endorsed the use of remote sensing (RS) for monitoring and evaluating progress toward achieving sustainable mountain development. Another study that used the Scopus database by (Baca-Neglia et al., 2025) to integrate Circular Economy (CE), Sustainable Development Goals (SDGs), and Industry 4.0 (I4.0) as mutually reinforcing frameworks.

3. Objectives/Research Questions

The present study aims to assess the contribution of the subject area “*Geography, Planning and Development*” (Scopus Subject Code: 3305) to the achievement of the United Nations Sustainable Development Goals (SDGs). The assessment is based on the abstracts of publications indexed in the Scopus database, enabling the identification and characterization of SDG-related research within the field. Specifically, it seeks to examine the overall publication output of the field, analyse the extent and distribution of its contributions across the various SDGs, and explore the temporal evolution of SDG-related research. The study also aims to identify emerging and trending research themes, investigate patterns of scientific collaboration among authors and countries, and determine the most influential and highly cited publications contributing to SDG-related research within the field.

4. Research Questions

RQ1. What is the overall publication output and growth pattern of research in the subject area of Geography?

RQ2. To what extent do publications in Geography contribute to the different Sustainable Development Goals, and how is this contribution distributed across the SDGs?

RQ3. How has SDG-related research in Geography evolved over time?

RQ4. What are the emerging and trending research themes within SDG-related publications in the field?

RQ5. What are the patterns of collaboration among authors and countries contributing to SDG-related research in Geography?

RQ6. Which publications have had the greatest scholarly impact on SDG-related research in the field, as measured by citation indicators?

5. Methodology

Data for the present study were retrieved from the Scopus database; this was selected because it is one of the most widely used and authoritative multidisciplinary citation databases for bibliometric and scientometric research. Although studies have reported that Google Scholar indexes a larger number of documents than Scopus (Martín-Martín et al., 2021), concerns regarding inconsistencies in indexing practices, citation quality, and the potential for citation manipulation have been highlighted in the literature (Halevi et al., 2017). Therefore, Scopus was considered more suitable for the present study due to its structured indexing, standardized metadata, and quality-controlled coverage. At the time of data retrieval, Scopus indexed more than 100 million⁶ records across diverse disciplines.

The Advanced Search option to retrieve data related to “*Geography, Planning and Development*” publications from India. The search query used mainly the ASJC⁷ classification code to search the subject under consideration. It was found that the overall production in the subject field under consideration is Table 1 presents the overall publications produced by India during the period 2015–2025 (date of data retrieval: 10 June 2026), this includes 19,213 articles.

The retrieved data were exported as CSV files by selecting all available information except the “Include References” option. This option was excluded because including cited references created problems in the exported files. Some publications contained cited references exceeding the character limit permitted for CSV cells, causing the data to spill over into subsequent columns and thereby disrupting the file structure. Therefore, the cited references field was excluded from the export process. Duplicate records were removed using the “Remove Duplicates” option available under the “Data” tab in Microsoft Excel. After removing 32 duplicate records, the final dataset consisted of 19,181 articles, which were subsequently processed using Biblum software (Umek, 2026).

⁶ <https://www.elsevier.com/products/scopus>

The dataset containing 19,181 articles was imported into Biblium. Under the “Advanced” option of the software, the “SDG Identifier” feature was selected. In the displayed tab, the text column was set as “Abstract,” and all output options, namely “Include Perspectives,” “Include Dimensions,” and “Add Results to Dataset”, were selected to identify the Sustainable Development Goals (SDGs) represented in the dataset. The analysis revealed 6410 SDG-related articles, accounting for 33.4% of the overall dataset. These publications were subsequently exported as an Excel file for further analysis.

The documents exported from Biblium as SDG-related publications (in CSV format) were matched with the main file containing “Full Record” data using the XLOOKUP function in Microsoft Excel 2021. Subsequently, these 6410 documents were analyzed in accordance with the objectives of the study.

This procedure was followed to explicitly identify and refine the SDG-related publications from the overall dataset. The exported files in the available formats do not indicate which specific publication belongs to which SDG category. Therefore, to explicitly determine the SDG classification of each publication, the above procedure was followed using the abstract text of the publications as the basis for SDG identification and refinement.

Table 1 *Search strings to retrieve the specific dataset.*

Search Query	Results
SUBJMAIN (3305) AND PUBYEAR > 2014 AND PUBYEAR < 2024	573,842*
SUBJMAIN (3305) AND (LIMIT-TO (AFFILCOUNTRY, “India”)) AND PUBYEAR > 2014 AND PUBYEAR < 2024	25,906
SUBJMAIN (3305) AND (LIMIT-TO (AFFILCOUNTRY, “India”)) AND (LIMIT-TO (LANGUAGE, “English”)) AND (LIMIT-TO (DOCTYPE, “ar”)) AND PUBYEAR > 2014 AND PUBYEAR < 2024	19,213

Note: The 3305 is the main subject code for the subject “*Geography, Planning and Development*” which falls under the subject “social Sciences” of the main 27 subject categories of the Scopus database

*This is the overall world contribution of the subject from 2015 to 2025.

6. Results

6.1. Preliminary Statistics of SDG-Related Research

Table 2 and Figure 1 show the distribution of SDG-related publications in Indian Geography, Planning and Development research between 2015 and 2025, while Table 3 summarises the key bibliometric characteristics of the dataset. A total of 6,410 articles were identified as SDG-related. Research was concentrated on SDG 15 (Life on Land) (1,882 publications; 9.8%), SDG 11 (Sustainable Cities and Communities) (1,461; 7.6%), and SDG 3 (Good Health and Well-being) (1,167; 6.1%), indicating a strong focus on environmental, urban, and spatial sustainability issues. In contrast, SDG 5 (Gender Equality), SDG 10 (Reduced Inequalities), and SDG 9 (Industry, Innovation and Infrastructure) received comparatively limited attention. As shown in Table 3, the SDG-related corpus comprised 6,410 publications produced by 14,690 authors from 7,902 institutions across 140 countries and published in 441 sources. The dataset recorded an average of 582.55 publications per year and a collaboration index of 3.87, highlighting the highly collaborative nature of the field. Overall, the results indicate that SDG-related research in Geography, Planning and Development represents a mature and internationally connected body of scholarship with a strong emphasis on environmental and urban dimensions of sustainable development.

Table 2 Distribution of SDGs in the Geography research data from 2015 to 2025.

SDG	Name	Documents	Percentage out of Overall
SDG01	No Poverty	937	4.9%
SDG02	Zero Hunger	820	4.3%
SDG03	Good Health and Well-being	1167	6.1%
SDG05	Gender Equality	275	1.4%
SDG09	Industry, Innovation and Infrastructure	385	2.0%
SDG10	Reduced Inequalities	323	1.7%
SDG11	Sustainable Cities and Communities	1461	7.6%
SDG12	Responsible Consumption and Production	744	3.9%
SDG15	Life on Land	1882	9.8%
Total		7994*	41.70%*

*Note: The overall contribution, both in terms of number and percentage, is higher because some documents fall under more than one SDG category.



Figure 1 Distribution of Geography research articles among SDGs in which they fall.

Table 3 Preliminary statistics of the SDG's

Main Information	Results
Timespan	2015-2025
Total Number of Countries	140
Total Number of Institutions	7902
Total Number of Sources	441
Total Number of References	0
Average Documents per Author	1.7
Average Documents per Institution	3.17

Average Documents per Source	14.53
Average Documents per Year	582.55
Total Number of Authors	14690
Total Number of Authors Keywords	17909
Total Number of Authors Keywords Plus	11829
Total Single-Authored Documents	553
Total Multi-Authored Documents	5855
Average Collaboration Index	3.87
Max H-Index	33
Max J-Index	35.33
Total Number of Citations	122665
Average Citations per Author	8.35
Average Citations per Institution	15.52
Average Citations per Document	19.14
Average Citations per Source	278.15

6.2. Trending Topics

While analysing the author keywords it was found that there are 6285 (98.1%) articles out of the total 6408 articles with author keywords and rest 125 articles were without author keywords as reflected in the data set of the Scopus. Analysing all those keywords Author keywords using scientopy (Ruiz-Rosero et al., 2019) for this evolution graph with window year as 5 for percentage of articles published in the last 5 years.

The trending topics by looking at the top author keywords based on the highest average growth rate (AGR). Figure 2 shows the evolution of topics related to SDG articles of the research topic under consideration top trending topics evolution plot. This evolution plot shows on the left side the accumulative number of documents (in logarithmic scale) versus the publication year. The beginning of the line in the X-axis represents the year when the topic research started, and the final of each line in the Y-axis represents the total number of articles published of each topic. On the right side, the Y-axis represents the AGR of each topic for the 2021–2025 period, and the X-axis represents percentage of documents in last years (PDLY). With this graph, we can analyze which are the topics with the higher AGR, and the higher PDLY. It is evident from the figure 2 that the trending topic with the highest absolute growth is *sustainability* (AGR = 11.2) is the most rapidly emerging research area. In contrast, *Machine Learning* emerged as the most rapidly expanding topic in relative terms indicating the increasing integration of artificial intelligence techniques within the research domain. Other emerging themes included *Sustainable Development Goals*, *Circular Economy*, and *Land Surface Temperature*, whereas *Remote Sensing*, and *Climate Change* remained the dominant and most influential themes throughout the study period.

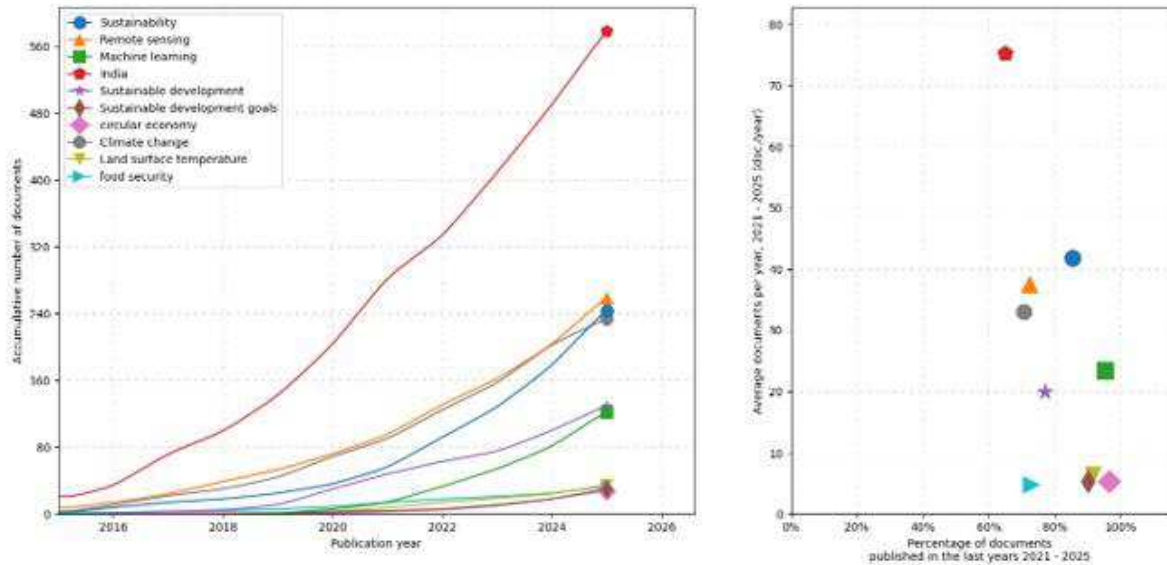


Figure 2 Evolution plot of top 10 author keywords of SDG articles related to Geography research

6.3. Text analysis using the titles and abstracts

To map the dominant research themes explored by Indian geography researchers, a thematic text analysis was conducted on a corpus of 6,410 articles. The “Titles and Abstracts” of these articles were compiled within a CSV file and analysed using Orange (Version 3.40.0)⁸, an open-source data mining and machine learning software. The workflow is represented in a figure 3 for both word cloud and topic modelling. This type of approach was also used by earlier studies (M. Mushtaq et al., 2024).

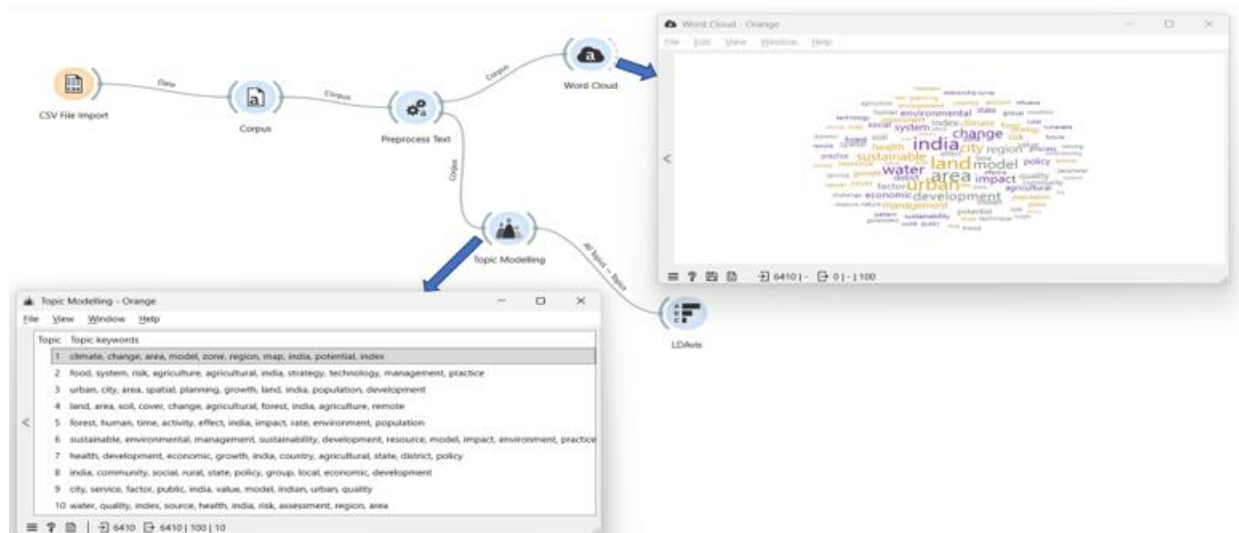


Figure 3 Workflow showing widgets for creating word cloud and topic modelling

⁸ <https://orangedatamining.com/>

To ensure the consistency and logical clearness of the resulting Word Cloud and Topic Model, a rigorous multi-stage text preprocessing and data-cleaning was performed using the *Preprocess Text widget*. Following are the four main steps to clean the data:

1. *Transformation*: The raw text was first normalized and stripped of formatting noise. This included four options that needs to be checked converting all text to *lowercase* to ensure consistency (e.g., merging “Climate” and “climate”), *remove accents*, *parse HTML*, and *remove URLs*.
2. *Tokenization*: in this a custom regular expression pattern ($\backslash w\{3,\}$) was used instead of Orange’s default tokenization setting ($\backslash w+$). The selected expression extracts only alphanumeric strings containing three or more characters, thereby excluding single-character and two-character tokens that often contribute little semantic value. This approach reduced noise and improved the quality of both topic modelling and word-frequency analyses. Using the custom expression pattern helps mathematically to exclude single letters (e.g., *a*, *x*, *i*) and disjointed two-letter fragments or abbreviations (e.g., *th*, *vs*, *id*) at the point of ingestion, preventing structural disorder from distorting the word cloud and Topic Model visuals.
3. *Normalization*: In this *WordNet Lemmatizer* was selected This process converts words to their base or dictionary forms (e.g., “studies” to “study” and “developing” to “develop”), thereby reducing vocabulary redundancy and improving thematic consistency.
4. *Filtering*: In this all the built-in standard filter options were enabled to automatically eliminate standard English stopwords and numeric values. Further, A specialized external plain text file (.txt) containing 182 curated academic and publishing stopwords was loaded. These targeted and removed pervasive journal metadata artifacts (e.g., *springer*, *elsevier*, *exclusive*, *licence*, *ltd*) and generic research reporting jargon (e.g., *wa*, *ha*, *found*, *observed*, *result*), which otherwise artificially expand term frequencies. Document frequency filtering was applied using relative thresholds of 0.10–0.90. The number of most frequent tokens retained was limited to 100.

After performing the above steps, the word cloud was created using the word cloud widget of the software (figure 4). the word cloud suggest that Indian geographers are intensely working on the rapid Core Focus (Urbanization and Regional Development urban expansion) that is also reflected in the earlier studies (Dutta, 2012; Sati & Mohan, 2017; P. Singh et al., 2017a; Sultana & Satyanarayana, 2018; Vijay et al., 2020; Zope et al., 2015, 2016). It is evident from the word cloud that the data terms in the cloud like land (7,324), urban (5,958), and city (4,258), closely tied to development (4,051) and region (3,173), are tracking how cities grow, how land use patterns shift, and the structural planning challenges of managing dynamic regional spaces.

The word cloud further actively examines the ecological consequences of growth. There is a clear emphasis on climate change vulnerability, evaluating environmental risks, and calculating the direct impacts of human activity on natural ecosystems , which further aligns with the evidence reported in previous studies (Din Waza et al., 2025; Meer & Mishra, 2020; S. Mushtaq et al., 2024; Pramanik & Punia, 2019; Rafiq et al., 2018; Rajkumari & Hussain, 2025; Sam & Balasubramanian, 2023; Shahfahad et al., 2021; Sultana & Satyanarayana, 2020; A. U. D. Waza et al., 2023, 2025; A. u D. Waza et al., 2026). Such ecological consequences and growth have had been suggested by the terms like change (4,215), impact (3,488), environmental (2,696), climate (2,654), and risk (2,395).

Terms in the cloud like water (4,754), soil (2,412), agricultural (2,071), forest (1,940), and food (1,945) highlighted the spatial analysis of critical natural resources is highly prominent by Indian geographers focused on physical and economic resource sustainability. It indicates extensive research into watershed management, soil degradation, agricultural landscape shifts, and forest cover monitoring all central to India’s food and water security agendas which (Bathla, 2000; Bhat et al., 2021; Bhat & Rather, 2018; A. Das et al., 2016; Golui et al., 2022; Jain, n.d.; Khatoon et al., 2026; Lone et al., 2021, 2022, 2023b, 2023a; M. I. Malik et al., 2011; Philip & Suresh, 2024; Rasool et al., 2018; Shanmugan & Baria, 2019; Thoker et al., 2024; Yaseen et al., 2025).

Terms like model (4,349), sustainable (3,682), index (2,718), spatial (2,021), and remote sensing (1,093) / 1,061) reveals that Indian geographers rely heavily on spatial modeling, index creation (like vulnerability or development indices), and Geospatial Technologies (GIS and Remote Sensing) to evaluate landscapes and prescribe sustainability pathways or policy framework Furthermore, previous studies have extensively employed GIS, Remote Sensing, and spatial modelling techniques to assess landscape dynamics, monitor environmental changes, and support sustainable planning and decision-making (Asadi et al., 2007; Chettry, 2021; S. Das, 2017; Dhanaraj & Angadi, 2022; Machiwal et al., 2011; M. I. Malik et al., 2016; Padmini et al., 2023; P. K. Patra et al., 2022; Rajasekhar et al., 2019; S Jamal, 2019; Sansare & Mhaske, 2018; Selvam et al., 2016; S. Singh et al., 2020; Srinivasa Rao & Jugran, 2003; A. U. D. Waza, 2023; A. U. D. Waza, Ikram, et al., 2025).

Figure 4 Word cloud of frequently used words

Furthermore, researchers used the topic modelling widget of the Software and selected the “Latent Dirichlet Allocation” with the number of topics as 10. This revealed the 10 topics from the inception of the SDGs by UN; the Indian research related to the geography (Table 3). LDAvis bar graphs are presented for each topic, which provides more details into the clustering of the topics. The bar graph shows the frequency distribution of the words in the documents (colour: grey). The red-shaded area describes the term frequency within each topic. The red-shaded area describes the term frequency within each topic (figure 5).

Table 3 Ten topics generated by analysing the 6410 articles related to geography.

S. No.	Keywords	BT
T1	climate, change, area, model, zone, region, map, India, potential, index	Climate Modeling
T2	food, system, risk, agriculture, agricultural, India, strategy, technology, management, practice	Agricultural Sustainability
T3	urban, city, area, spatial, planning, growth, land, India, population, development	Urban Planning
T4	land, area, soil, cover, change, agricultural, forest, India, agriculture, remote	Land Cover Dynamics
T5	forest, human, time, activity, effect, India, impact, rate, environment, population	Human-Environment Interaction
T6	sustainable, environmental, management, sustainability, development, resource, model, impact, environment, practice	Sustainability Studies
T7	health, development, economic, growth, India, country, agricultural, state, district, policy	Health and Development

T8	India, community, social, rural, state, policy, group, local, economic, development	Community Development
T9	city, service, factor, public, India, value, model, Indian, urban, quality	Urban Livability
T10	water, quality, index, source, health, India, risk, assessment, region, area	Water Quality Assessment

Figure 5 a–j bar graphs represent each topic 20 most relevant terms, showing overall term frequency and term frequency within the topic

6.4. Co-authorship/ authors/ countries

These visualizations graphs were created using VOSViewer (van Eck & Waltman, 2010)

1. Authors: It was found that all those SDG articles were produced by 17845 authors. Based on the degree of collaborative publications, co-authorship analysis reveals collaboration trends among authors engaged in a field of research (Vaidya et al., 2021), this visualization graph was created using the criterion of minimum 10 documents with minimum of 200 citations of an authors reflected in the Scopus database, this displays that out of the total authors 45 meet the threshold, out of these 45 authors 34 authors were interconnected with each other (Figure 6). This interconnectedness reflects that authors collaborative network are more likely to mention related articles (Khanra et al., 2022a). The Figure 6 shows, 34 out of the total authors who contributed articles appear in the co-authorship network, which comprised 3 clusters of 13, 11 and 10 authors.

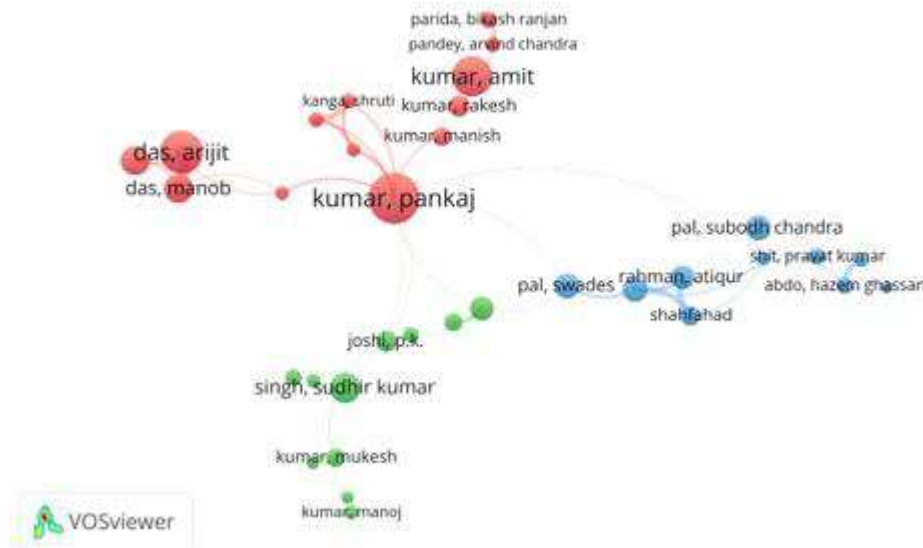


Figure 6 co-authorship network

2. Countries: The analysis revealed that Indian geography researchers collaborated with scholars from 154 countries. To visualize the most significant international research collaborations, a country collaboration network was generated (Fig. 7) using a threshold of a minimum of 50 documents and at least 1,000 citations. The resulting network highlights the countries that have established the strongest collaborative ties with Indian researchers in the field.

It is evident from the Figure 7, that Indian researchers have particularly strong collaborative relationships with the United States, the United Kingdom, and Saudi Arabia. These findings indicate a high level of international engagement and knowledge exchange between Indian geographers and researchers from these countries. Similar patterns of close international research collaboration have also been reported by (B. A. Malik et al., 2021) in their study of research output from Jammu and Kashmir, a Union Territory of India.

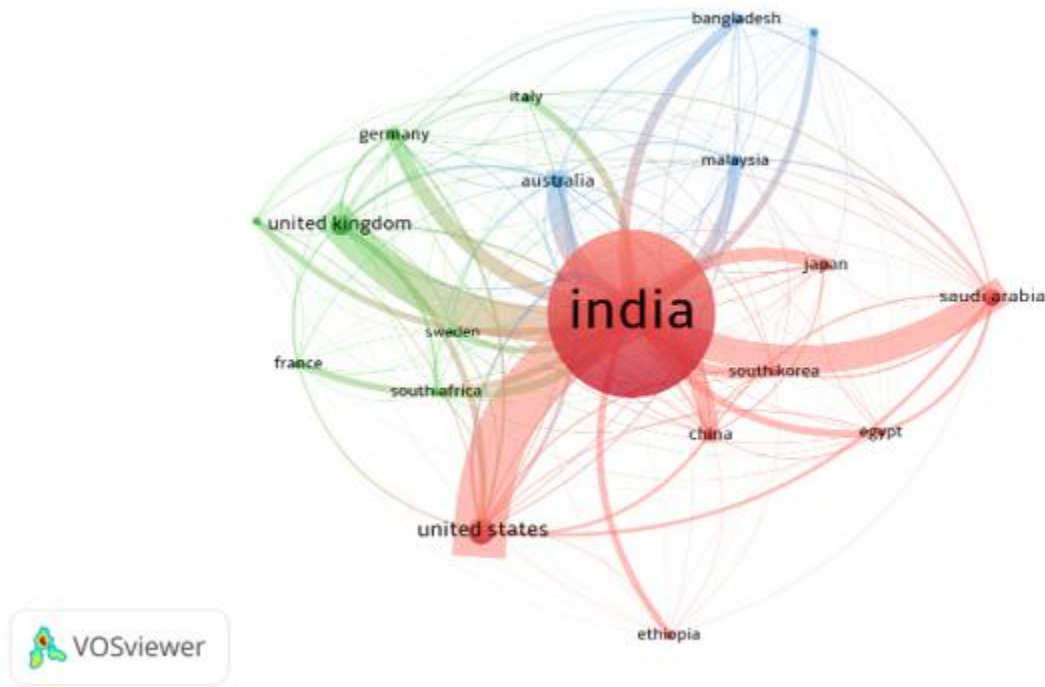


Figure 7 Country collaboration of Indian Geographers.

6.5. Most impactful publications

The analysis of the ten most cited publications (Table 4) reveals a strong concentration of research around SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 11 (Sustainable Cities and Communities), SDG 15 (Life on Land), SDG 9 (Industry, Innovation and Infrastructure), and SDG 3 (Good Health and Well-Being). Among these, SDG 1 and SDG 2 received considerable scholarly attention, particularly in relation to climate change, agricultural sustainability, and livelihood resilience. Research highlighted how improved land-use management practices such as multiple cropping, irrigation, and fertilizer use enhanced agricultural productivity and food security, while also emphasizing ecosystem restoration and sustainable land management. Similarly, studies stressed the importance of climate-smart agriculture (CSA), crop diversification, improved irrigation, and adaptive farming practices in strengthening food security and reducing livelihood vulnerability among smallholder farming communities. These studies further underscored that climate change disproportionately affects vulnerable populations, particularly women farmers with limited access to resources and adaptive opportunities, thereby linking poverty reduction with agricultural resilience (Aryal et al., 2020b; Chen et al., 2019; Jost et al., 2016).

Table 4 <i>Ten most cited publications</i>				
S No.	Title	Cited by	SDG	Reference
1.	China and India lead in greening of the world through land-use management	2728	SDG02 & SDG15	(Chen et al., 2019)
2.	Climate change and agriculture in South Asia: adaptation options in smallholder production systems	590	SDG01 & SDG02	(Aryal et al., 2020a)
3.	Enabling technologies and sustainable smart cities	547	SDG11	(Ahad et al., 2020)
4.	A resource-based view of green innovation as a strategic firm resource: Present status and future directions	463	SDG09	(Khanra et al., 2022b)
5.	Impact of land use change and urbanization on urban heat island in Lucknow city, Central India. A remote sensing-based estimate	445	SDG15	(P. Singh et al., 2017b)
6.	Deep learning and medical image processing for coronavirus (COVID-19) pandemic: A survey	425	SDG03	(Bhattacharya et al., 2021)
7.	Increase in extreme precipitation events under anthropogenic warming in India	354	SDG11	(Mukherjee et al., 2018)
8.	Blockchain for smart cities: A review of architectures, integration trends and future research directions	351	SDG11	(Bhushan et al., 2020)
9.	Impacts of urbanization on land use /cover changes and its probable implications on local climate and groundwater level	342	SDG15	(S. Patra, Sahoo, Mishra, & Chandra, 2018)
10.	Understanding gender dimensions of agriculture and climate change in smallholder farming communities	331	SDG01 & SDG02	(Jost et al., 2016)

Studies related to SDG 11 (Sustainable Cities and Communities) primarily focused on sustainable urban systems, technological innovation, and climate resilience. Research emphasized the growing role of ICT, IoT, AI, blockchain, and geospatial technologies in improving urban governance, infrastructure, mobility, and service delivery in smart cities. Likewise, studies highlighted the increasing vulnerability of Indian cities to extreme precipitation events and urban flooding, emphasizing the importance of climate-resilient urban planning, disaster preparedness, and sustainable infrastructure development for resilient urban systems (Ahad et al., 2020; Bhushan et al., 2020; Mukherjee et al., 2018).

Similarly, research associated with SDG 15 (Life on Land) highlighted the ecological implications of rapid urbanization and land-use transformation. Studies documented the decline of vegetation cover, wetlands, water bodies, and agricultural land due to expanding built-up areas, resulting in ecological degradation and environmental stress. These findings reinforce the importance of sustainable land-use planning, ecosystem conservation, and restoration efforts to maintain ecological balance and terrestrial sustainability (Chen et al., 2019; S. Patra, Sahoo, Mishra, & Mahapatra, 2018; P. Singh et al., 2017b).

In addition, research linked to SDG 9 (Industry, Innovation and Infrastructure) emphasized the role of green innovation, eco-friendly industrial practices, sustainable product design, and environmentally responsible manufacturing systems in achieving resilient and sustainable industrial growth. Studies highlighted how green innovation, sustainable technological advancement, green supply chains, and eco-innovation can strengthen industrial productivity, competitiveness, and resource-efficient production systems, thereby contributing to sustainable industrialization and innovation-driven growth (Khanra et al., 2022c).

Likewise, studies associated with SDG 3 (Good Health and Well-Being) emphasized the growing importance of technological interventions in improving healthcare systems. Research demonstrated the role of artificial intelligence and deep learning technologies in improving disease diagnosis, medical image processing, and healthcare efficiency during the COVID-19 pandemic, thereby highlighting their potential for strengthening healthcare delivery and public health preparedness (Bhattacharya et al., 2021).

6.6. Discussion

The present study examined how research in Geography, Planning and Development in India (Scopus subject code 3305) engaged with the Sustainable Development Goals (SDGs) between 2015 and 2025. The finding revealed that 6,410 of 19,181 articles (33.4%) addressed at least one SDG demonstrates that sustainability has become an integral component of the discipline rather than a peripheral research theme. Within a decade of the adoption of the 2030 Agenda, approximately one-third of all publications in the field explicitly incorporated SDG-related perspectives, reflecting the increasing integration of sustainability concerns into mainstream geographical research. This trend is consistent with broader assessments that highlight geography's unique interdisciplinary capacity to address sustainability challenges due to their inherently spatial nature (Nightingale, 2018; Pereira & Zhao, 2025b). It also mirrors the wider expansion of SDG-oriented research across Indian science (Singh, Kanaujia, Vivek, et al., 2022) and the rapid growth of global sustainability scholarship following the adoption of the SDGs (Mishra et al., 2023). Nevertheless, this proportion should be interpreted cautiously because SDG identification was based solely on article abstracts. Studies that contribute to sustainability objectives without explicitly employing SDG terminology may not have been captured, suggesting that the actual contribution of Indian geographical research to the SDGs is likely greater than indicated by the present analysis.

The distribution of SDG engagement was strongly concentrated around environmentally and spatially oriented goals, particularly Life on Land (SDG 15), Sustainable Cities and Communities (SDG 11), Good Health and Well-being (SDG 3), No Poverty (SDG 1), and Zero Hunger (SDG 2). This pattern reflects the methodological and conceptual foundations of geography, a finding reinforced by both the word-cloud and topic-modelling analyses. The prominence of terms such as land, urban, city, water, soil, and climate, alongside dominant topics including Land Cover Dynamics, Urban Planning, and Water Quality Assessment, demonstrates that Indian geographers primarily engage with sustainability challenges that possess strong spatial, environmental, and territorial dimensions. The goals receiving

the greatest scholarly attention are those that can be effectively observed, measured, and mapped through geographical methods and geospatial technologies.

This finding aligns with longstanding arguments that geography contributes to sustainability by integrating environmental, economic, and socio-spatial dimensions of development (Meadows, 2020; La Torre et al., 2019). Global analyses similarly identify land systems, urbanization, and climate-related themes as the principal pathways through which geography contributes to the SDGs (Ni et al., 2025b; Nightingale, 2018). The strong representation of SDGs 15 and 11 also mirrors patterns observed in remote-sensing-based SDG research worldwide (Ekmen & Kocaman, 2024), suggesting that the Indian experience reflects broader disciplinary tendencies rather than exclusively national priorities. The extensive use of remote sensing, GIS, and spatial modelling observed throughout the corpus further reinforces this interpretation. Such methods have become increasingly important for monitoring SDG progress, particularly in countries where conventional statistical data are limited or unevenly distributed. Their widespread adoption indicates that Indian geographical research is methodologically aligned with contemporary international practice in sustainability assessment and monitoring.

The most significant finding concerns the uneven distribution of research attention across the SDGs. Gender Equality (SDG 5), Reduced Inequalities (SDG 10), and Industry, Innovation and Infrastructure (SDG 9) received comparatively limited attention, while goals associated with governance, institutions, partnerships, affordable energy, and life below water were only marginally represented. Two explanations may account for this pattern. First, geography in India may continue to prioritize biophysical, environmental, and territorial questions over social, institutional, and governance dimensions of sustainability. Second, abstract-based SDG identification may underrepresent social-science research because such studies often employ less standardized terminology than environmental research. While both explanations are plausible, the magnitude of the observed disparities suggests that methodological limitations alone cannot fully explain the imbalance.

This uneven engagement has important implications for sustainability research and policy. India's SDG implementation framework, including the SDG India Index and ongoing localization initiatives, places substantial emphasis on equity, gender inclusion, institutional effectiveness, and regional disparities (NITI Aayog, 2024)⁹. Numerous assessments have demonstrated that significant inter-state and inter-district inequalities continue to shape national progress toward the SDGs (Garai et al., 2026). Consequently, the comparatively limited attention devoted to these issues reveals a gap between geographical scholarship and national sustainability priorities. This gap is particularly notable because geography possesses powerful conceptual and methodological tools for examining spatial inequality, social exclusion, and uneven development. Previous studies have successfully applied geographical perspectives to gender-sensitive urban planning and climate-vulnerable livelihoods (González & Sebastián-López, 2022; Jost et al., 2016), demonstrating that the shortfall reflects research priorities rather than disciplinary constraints.

The temporal analysis reveals a discipline undergoing significant methodological transformation. Sustainability emerged as the theme with the greatest absolute growth, while Machine Learning exhibited the highest relative growth rate. Land Surface Temperature also emerged as a rapidly expanding topic, whereas Remote Sensing and Climate Change remained consistently dominant throughout the study period. These trends point to an increasing integration of computational approaches, artificial intelligence, and advanced geospatial analytics within geographical research.

This methodological shift reflects wider developments across sustainability science, where machine learning and data-driven approaches are increasingly employed to address complex environmental and urban challenges (Ekmen & Kocaman, 2024). The growing influence of smart-city research, health informatics, and digital technologies among highly cited studies further supports this interpretation. While these developments substantially enhance analytical capacity, they also raise important questions about research direction. The increasing availability of advanced geospatial data and computational tools may inadvertently encourage researchers to focus on sustainability challenges that are more easily measurable, modelled, and mapped. Consequently, methodological advances may unintentionally

⁹ https://www.niti.gov.in/sites/default/files/2024-07/SDG_India_Index_2023-24.pdf

reinforce the existing concentration on environmental and land-based SDGs while leaving more complex social and governance issues comparatively underexplored.

The co-authorship and international collaboration networks reveal a research community that is globally connected but unevenly integrated. The strongest international partnerships were observed with the United States, the United Kingdom, and Saudi Arabia, indicating significant knowledge exchange with both established scientific centres and emerging regional partners. Similar patterns have been documented across Indian research more broadly, where international collaboration is consistently associated with higher citation impact and greater thematic visibility (Osman et al., 2025; Mishra et al., 2024).

However, collaboration with neighbouring developing countries and other Asian nations remains relatively limited. This is noteworthy because many countries across South Asia and the Global South face comparable challenges related to rapid urbanization, agricultural transformation, climate vulnerability, and environmental degradation. Expanding South–South collaboration could facilitate the production of more contextually relevant and transferable sustainability knowledge while strengthening regional research capacity. Greater engagement with countries experiencing similar developmental trajectories may therefore complement existing partnerships with Global North institutions and broaden the geographical relevance of sustainability research.

The citation analysis reinforces the thematic patterns identified throughout the corpus. The most influential studies focused predominantly on land-use management, climate-smart agriculture, urban sustainability, smart cities, green innovation, environmental monitoring, and health-related applications. These themes correspond closely to SDGs 1, 2, 3, 9, 11, and 15, indicating that the highest-impact research has largely emerged from the environmental and spatial core of the discipline.

The concentration of scholarly influence around these themes suggests a self-reinforcing dynamic within the field. Topics that attract substantial research attention also tend to generate higher citation impact, thereby influencing future research agendas and directing scholarly attention toward already established areas of strength. While this process contributes to the consolidation of expertise in critical sustainability domains, it may simultaneously limit the development of research on underrepresented goals associated with inequality, governance, institutions, and social justice.

The findings both complement and extend existing scholarship on SDG research. While previous studies have documented geography's broad contribution to sustainability science and mapped the global expansion of SDG-related research (Ni et al., 2025; Pereira & Zhao, 2025; Mishra et al., 2024), the present analysis provides a discipline-specific assessment within the Indian context. In doing so, it reveals important internal imbalances that are often obscured in broader bibliometric studies. The results confirm geography's considerable strength in addressing environmentally and spatially oriented sustainability challenges while highlighting significant opportunities for greater engagement with social, institutional, and governance dimensions of sustainable development.

Methodologically, the study also demonstrates the value of abstract-based SDG identification for large-scale disciplinary analyses. Although this approach is constrained by authors' use of explicit SDG terminology, it provides a systematic and scalable means of examining sustainability engagement across extensive publication datasets. The strengths and limitations identified here are consistent with those reported in bibliometric studies conducted across a range of disciplines and research domains.

6.7 Implications of the studies

Overall, the findings demonstrate that sustainability has become firmly embedded within Indian geographical research, but that engagement remains uneven across the SDG framework. The discipline's strongest contributions continue to be concentrated in land systems, urban studies, environmental monitoring, and resource management, reflecting geography's enduring spatial and environmental orientation. At the same time, the limited attention devoted

to gender equality, inequalities, governance, and institutional dimensions of sustainability highlights important opportunities for future research.

For researchers, these findings identify significant scope for expanding geographical scholarship into the social and equity-related dimensions of sustainable development. For policymakers and planners, they underscore the importance of encouraging interdisciplinary collaborations and research initiatives that bridge environmental and social perspectives. A more balanced engagement across the SDGs would enhance geography's capacity to contribute to India's sustainability agenda and strengthen the discipline's role in addressing the interconnected challenges of the 2030 Agenda.

6.8 Conclusion

This study examined the engagement of Indian research in Geography, Planning and Development (Scopus subject code 3305) with the Sustainable Development Goals during 2015-2025. Of the 19,181 articles analysed, 6,410 (33.4%) addressed at least one SDG, indicating that sustainability has become a well-established component of the discipline rather than a peripheral concern. Research activity was concentrated around environmentally and spatially oriented goals, particularly Life on Land, Sustainable Cities and Communities, Good Health and Well-being, No Poverty, and Zero Hunger. This pattern reflects geography's methodological strengths in remote sensing, GIS, and spatial modelling, as demonstrated by the prominence of themes such as land-cover dynamics, urban planning, and water resource assessment. The findings closely resemble trends reported in global geographical and geospatial SDG research, suggesting that this emphasis reflects a broader disciplinary orientation rather than a uniquely Indian phenomenon.

In contrast, goals related to gender equality, reduced inequalities, and the institutional and governance dimensions of sustainable development received comparatively limited attention, while several SDGs remained only marginally represented. Although part of this imbalance may be influenced by the abstract-based detection approach, the scale of the disparity suggests a genuine preference for environmental and territorial issues over social and institutional concerns. This highlights an important gap between current research priorities and India's broader sustainability agenda, which places considerable emphasis on equity, inclusion, and institutional effectiveness. Given its strong tradition of analysing spatial disparities and uneven development, geography is particularly well positioned to contribute more actively to these underrepresented areas.

The study also revealed strong international collaboration, particularly with the United States, the United Kingdom, and Saudi Arabia, while collaboration with developing countries and regional partners remained comparatively limited. At the same time, the rapid growth of sustainability, machine learning, and land surface temperature research points to a discipline that is becoming increasingly data-driven and technologically sophisticated.

Overall, the findings demonstrate that Indian geography has made significant contributions to understanding the environmental and spatial dimensions of sustainable development. However, achieving a more balanced engagement across the full spectrum of the SDGs will require greater attention to social, economic, and governance-related challenges. Expanding interdisciplinary research, strengthening regional and South-South collaborations, and applying geographical approaches to issues of equity, inclusion, and institutional performance would help align future scholarship more closely with India's sustainability priorities and the aspirations of the 2030 Agenda for Sustainable Development. Future studies incorporating additional databases, document types, languages, and full-text analyses could provide a more comprehensive understanding of the discipline's evolving contribution to sustainable development.

6.9 Limitations and Future Research

This study is subject to several limitations. First, the analysis was restricted to English-language journal articles indexed in the Scopus database, which may have excluded relevant publications available in other databases and languages. Second, the identification of Sustainable Development Goal (SDG)-related publications was based solely on the analysis of abstracts extracted from the main dataset using the SUBJMAIN field. Consequently, some relevant studies may not have been captured if SDG-related content was discussed in other text fields rather than in the abstract.

Another limitation arises from the use of subject classification codes. Since many subject codes overlap across multiple disciplines, some publications included in the dataset may reflect contributions from fields other than geography. Therefore, the dataset may encompass a broader interdisciplinary scope than intended.

Future research may overcome these limitations by expanding the data sources to include other bibliographic databases, such as Web of Science, Dimensions, and Crossref, as well as additional document types, including books, book chapters, conference proceedings, and review articles. Furthermore, studies could incorporate publications in languages other than English to provide a more comprehensive global perspective. Future investigations may also employ multiple text fields including titles, author keywords, index keywords, and abstracts to improve the identification and classification of SDG-related research and enhance the robustness of the findings.

References

- Ahad, M. A., Paiva, S., Tripathi, G., & Feroz, N. (2020). Enabling technologies and sustainable smart cities. *Sustainable Cities and Society*, 61. <https://doi.org/10.1016/j.scs.2020.102301>
- Ansari, A. J., Vaidya, P., Malik, B. A., & Ali, P. M. N. (2024). Preparing for the unthinkable: A systematic look at disaster preparedness in libraries. *International Journal of Disaster Risk Reduction*, 108(December 2023), 104551. <https://doi.org/10.1016/j.ijdr.2024.104551>
- Aryal, J. P., Sapkota, T. B., Khurana, R., Khatri-Chhetri, A., Rahut, D. B., & Jat, M. L. (2020a). Climate change and agriculture in South Asia: adaptation options in smallholder production systems. *Environment, Development and Sustainability*, 22(6), 5045–5075. <https://doi.org/10.1007/s10668-019-00414-4>
- Aryal, J. P., Sapkota, T. B., Khurana, R., Khatri-Chhetri, A., Rahut, D. B., & Jat, M. L. (2020b). Climate change and agriculture in South Asia: adaptation options in smallholder production systems. *Environment, Development and Sustainability*, 22(6), 5045–5075. <https://doi.org/10.1007/s10668-019-00414-4>
- Asadi, S. S., Vuppala, P., & Reddy, M. A. (2007). Remote sensing and GIS techniques for evaluation of groundwater quality in municipal corporation of hyderabad (zone-V), India. *International Journal of Environmental Research and Public Health*, 4(1), 45–52. <https://doi.org/10.3390/ijerph2007010008>
- Baca-Neglia, M., Barreto-Pio, C., Virú-Vásquez, P., Badillo-Rivera, E., Césare-Coral, M. F., Castro-Pantoja, J. B., Sotelo-Méndez, A., Saldivar-Villaruel, J., Arroyo-Paz, A., Cruz-Martinez, R. V., Norabuena Meza, E., & Quispe-Ojeda, T. C. (2025). Industry 4.0, Circular Economy and Sustainable Development Goals: Future Research Directions Through Scientometrics and Mini-Review. In *Sustainability (Switzerland)* (Vol. 17, Number 14). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/su17146468>
- Bathla, S. (2000). *WATER RESOURCE POTENTIAL IN NORTHERN INDIA: CONSTRAINTS AND ANALYSES OF PRICE AND NON-PRICE SOLUTIONS*.
- Bhat, M. S., Lone, F. A., Shafiq, M. ul, & Rather, J. A. (2021). Evaluation of long term trends in apple cultivation and its productivity in Jammu and Kashmir from 1975 to 2015. *GeoJournal*, 86(3), 1193–1202. <https://doi.org/10.1007/s10708-019-10112-3>

- Bhat, M. S., & Rather, J. A. (2018). Impact of Climate Change on Spring Season in the North-Western Himalayas: a Study of Kashmir Valley, India (1901-2000). *Int J Adv Res Sci Technol*, 7(4), 873–881.
- Bhattacharya, S., Reddy Maddikunta, P. K., Pham, Q. V., Gadekallu, T. R., Krishnan S, S. R., Chowdhary, C. L., Alazab, M., & Jalil Piran, M. (2021). Deep learning and medical image processing for coronavirus (COVID-19) pandemic: A survey. *Sustainable Cities and Society*, 65. <https://doi.org/10.1016/j.scs.2020.102589>
- Bhushan, B., Khamparia, A., Sagayam, K. M., Sharma, S. K., Ahad, M. A., & Debnath, N. C. (2020). Blockchain for smart cities: A review of architectures, integration trends and future research directions. *Sustainable Cities and Society*, 61. <https://doi.org/10.1016/j.scs.2020.102360>
- Bian, J., Zhao, J., & Li, A. (2025). Remote sensing monitoring of mountain sustainable development goals (SDG15.4): a systematic review. In *International Journal of Digital Earth* (Vol. 18, Number 1). Taylor and Francis Ltd. <https://doi.org/10.1080/17538947.2024.2448216>
- Bulut, M., & Çağlar, S. (2025). Contribution of psychology to sustainable development goals: a bibliometric analysis: Sustainable development goals in psychology. *Current Psychology*, 44(11), 9911–9924. <https://doi.org/10.1007/s12144-025-07836-6>
- Chen, C., Park, T., Wang, X., Piao, S., Xu, B., Chaturvedi, R. K., Fuchs, R., Brovkin, V., Ciais, P., Fensholt, R., Tømmervik, H., Bala, G., Zhu, Z., Nemani, R. R., & Myneni, R. B. (2019). China and India lead in greening of the world through land-use management. *Nature Sustainability*, 2(2), 122–129. <https://doi.org/10.1038/s41893-019-0220-7>
- Chetty, V. (2021). Delineating Urban Growth Boundary Using Remote sensing , ANN-MLP and CA model : A Case Study of Thiruvananthapuram Urban. *Journal of the Indian Society of Remote Sensing*, 49(10), 2437–2450. <https://doi.org/10.1007/s12524-021-01401-x>
- Dar, S. A., Verma, P., Mir, M. Y., Ray, S., Banoo, H., & Dar, S. N. (2026). Climate action and resilience strategies for achieving SDG 13 in the North Western Himalayas. *Discover Environment*, 4(1). <https://doi.org/10.1007/s44274-025-00401-9>
- Das, A., Khan, A., Daspatanayak, P., Chatterjee, S., & Hassan, M. I. (2016). Regional model for agricultural imbalances in West Bengal, India. *Modeling Earth Systems and Environment*, 2(2). <https://doi.org/10.1007/s40808-016-0107-9>
- Das, S. (2017). Delineation of groundwater potential zone in hard rock terrain in Gangajalghati block, Bankura district, India using remote sensing and GIS techniques. *Modeling Earth Systems and Environment*, 3(4), 1589–1599. <https://doi.org/10.1007/s40808-017-0396-7>
- Dhanaraj, K., & Angadi, D. P. (2022). Land use land cover mapping and monitoring urban growth using remote sensing and GIS techniques in Mangaluru, India. *GeoJournal*, 87(2), 1133–1159. <https://doi.org/10.1007/s10708-020-10302-4>
- Din Waza, A. U., Bhat, M. S., Kannojiya, K. R., Rather, J. A., Rather, J. A., Kumar, D., Sudhan Yadav, S., & Yadav, V. (2026). Geospatial analysis of peri urban expansion and growth drivers around Patna Municipal Corporation Bihar, India. *Discover Cities*, 3(1), 90. <https://doi.org/10.1007/s44327-026-00269-1>
- Din Waza, A. U., Rather, J. A., Bhat, M. S., Maqbool, S., Bhat, A. A., & Tandup, C. (2025). Dynamics of Cropping Pattern and its Drivers and Impacts : A Theil – Sen Estimator Approach in Anantnag District , Kashmir. *Current Agriculture Research Journal*, 13(2), 521–533. <https://doi.org/http://dx.doi.org/10.12944/CARJ.13.2.11>

- Dutta, V. (2012). Land Use Dynamics and Peri-urban Growth Characteristics: Reflections on Master Plan and Urban Suitability from a Sprawling North Indian City. *Environment and Urbanization Asia*, 3(2), 277–301. <https://doi.org/10.1177/0975425312473226>
- Ekmen, O., & Kocaman, S. (2024). Remote sensing for UN SDGs: A global analysis of research and collaborations. *The Egyptian Journal of Remote Sensing and Space Sciences*, 27(2), 329–341. <https://doi.org/10.1016/J.EJRS.2024.04.002>
- Ferreira, D. R., & Valdati, J. (2023). Geoparks and Sustainable Development: Systematic Review. In *Geoheritage* (Vol. 15, Number 1). Springer. <https://doi.org/10.1007/s12371-022-00775-9>
- Garai, N., Roy, A., & Pramanick, K. (2026). Unravelling sustainable development at the sub-national scale in India. *Environmental Development*, 57, 101336. <https://doi.org/10.1016/J.ENVDEV.2025.101336>
- Golui, D., Dali, M., Singh, R., Datta, S. P., Mandal, J., Ray, P., Trivedi, V. K., Gupta, A. K., & Kumar, R. (2022). Assessing Soil Degradation and Risk in Relation to Metal Pollution in Hindon River Water-Irrigated Soils of Western Uttar Pradesh of India. *Water, Air, and Soil Pollution*, 233(5). <https://doi.org/10.1007/s11270-022-05640-7>
- González, R. de M., & Sebastián-López, M. (2022). Education on Sustainable Development Goals: Geographical Perspectives for Gender Equality in Sustainable Cities and Communities. *Sustainability (Switzerland)*, 14(7). <https://doi.org/10.3390/su14074042>
- Halevi, G., Moed, H., & Bar-Ilan, J. (2017). Suitability of Google Scholar as a source of scientific information and as a source of data for scientific evaluation—Review of the Literature. In *Journal of Informetrics* (Vol. 11, Number 3, pp. 823–834). Elsevier Ltd. <https://doi.org/10.1016/j.joi.2017.06.005>
- Jain, S. K. (n.d.). *Water resources management in India-challenges and the way forward*.
- Jost, C., Kyazze, F., Naab, J., Neelormi, S., Kinyangi, J., Zougmore, R., Aggarwal, P., Bhatta, G., Chaudhury, M., Tapio-Bistrom, M. L., Nelson, S., & Kristjanson, P. (2016). Understanding gender dimensions of agriculture and climate change in smallholder farming communities. *Climate and Development*, 8(2), 133–144. <https://doi.org/10.1080/17565529.2015.1050978>
- Khanra, S., Kaur, P., Joseph, R. P., Malik, A., & Dhir, A. (2022a). A resource-based view of green innovation as a strategic firm resource: Present status and future directions. *Business Strategy and the Environment*, 31(4), 1395–1413. <https://doi.org/10.1002/bse.2961>
- Khanra, S., Kaur, P., Joseph, R. P., Malik, A., & Dhir, A. (2022b). A resource-based view of green innovation as a strategic firm resource: Present status and future directions. *Business Strategy and the Environment*, 31(4), 1395–1413. <https://doi.org/10.1002/bse.2961>
- Khanra, S., Kaur, P., Joseph, R. P., Malik, A., & Dhir, A. (2022c). A resource-based view of green innovation as a strategic firm resource: Present status and future directions. *Business Strategy and the Environment*, 31(4), 1395–1413. <https://doi.org/10.1002/bse.2961>
- Khatoon, N., Rajput, S., & Khan, M. R. (2026). Assessing food security and agricultural performance through infrastructure and sustainability indicators in India. *Discover Sustainability*. <https://doi.org/10.1007/s43621-025-02156-y>
- La Torre, D., Liuzzi, D., & Marsiglio, S. (2019). Population and geography do matter for sustainable development. *Environment and Development Economics*, 24(2), 201–223. <https://doi.org/10.1017/S1355770X18000475>

- Lone, F. A., Ganaie, M. I., Ganaie, S. A., Bhat, M. S., & Rather, J. A. (2023a). Drivers of agricultural land-use change in Kashmir valley - an application of mixed method approach. *Letters in Spatial and Resource Sciences*, 16(1), 1–20. <https://doi.org/10.1007/s12076-023-00345-9>
- Lone, F. A., Ganaie, M. I., Ganaie, S. A., Bhat, M. S., & Rather, J. A. (2023b). Evaluation Criteria for the Suitability of Apple Cultivation in Kashmir Valley, India. *Asian Journal of Agriculture and Development*, 20(1), 71–85. <https://doi.org/10.37801/ajad2023.20.1.p1>
- Lone, F. A., Ganaie, S. A., Ganaie, M. I., Shafi Bhat, M., & Rather, J. A. (2022). Geo-economic Feasibility of Apple Orchards Across Physiographic Divisions in Kashmir Valley, India. *Journal of Geographical Studies*, 6(1), 40–48. <https://doi.org/10.21523/gcj5.22060103>
- Lone, F. A., Nanda, A. M., Rather, J. A., Bhat, M. S., & Kant, T. A. (2021). Resource Use Efficiency of Rice Farming in Jammu and Kashmir, India. *Agricultural Research Journal*, 58(3), 521–526. <https://doi.org/10.5958/2395-146X.2021.00075.2>
- Machiwal, D., Jha, M. K., & Mal, B. C. (2011). Assessment of Groundwater Potential in a Semi-Arid Region of India Using Remote Sensing, GIS and MCDM Techniques. *Water Resources Management*, 25(5), 1359–1386. <https://doi.org/10.1007/s11269-010-9749-y>
- Malik, B. A., Aftab, A., & Naushad Ali, P. M. (2019). Mapping of crowdsourcing research: A bibliometric analysis. *DESIDOC Journal of Library and Information Technology*, 39(1), 23–30. <https://doi.org/10.14429/djlit.39.1.13630>
- Malik, B. A., Mushtaq, M., & Malik, M. A. (2021). Research Output of Jammu and Kashmir Articles: A Scientometric Analysis Using Science Citation Index–Expanded. *Serials Librarian*, 81(2), 176–189. <https://doi.org/10.1080/0361526X.2021.1882641>
- Malik, M. I., Bhat, M. S., & Kuchay, N. A. (2011). Anthropogenic impact on forest cover in the Western Himalayas: A case study of lidder catchment in Kashmir valley. *Transactions of the Institute of Indian Geographers*, 33(1), 55–65.
- Malik, M. I., Bhat, M. S., & Najar, S. A. (2016). Remote Sensing and GIS based groundwater potential mapping for sustainable water resource management of Lidder catchment in Kashmir Valley, India. *Journal of the Geological Society of India*, 87(6), 716–726. <https://doi.org/10.1007/s12594-016-0444-3>
- Manakane, S. E., Latue, E. C., Somae, C., & Rakuasa, G. (2023). The Role of Geography Research in Supporting Sustainable Development in Ambon City. *Indonesia: A Review. Sinergi International Journal of Economics*, 1(2), 64–75. <https://journal.sinergi.or.id/>
- Martín-Martín, A., Thelwall, M., Orduna-Malea, E., & Delgado López-Cózar, E. (2021). Google Scholar, Microsoft Academic, Scopus, Dimensions, Web of Science, and OpenCitations' COCI: a multidisciplinary comparison of coverage via citations. *Scientometrics*, 126(1), 871–906. <https://doi.org/10.1007/s11192-020-03690-4>
- Meadows, M. E. (2020). Geography Education for Sustainable Development. *Geography and Sustainability*, 1(1), 88–92. <https://doi.org/10.1016/j.geosus.2020.02.001>
- Meer, M. S., & Mishra, A. K. (2020). Remote Sensing Application for Exploring Changes in Land-Use and Land-Cover Over a District in Northern India Remote Sensing Application for Exploring Changes in Land-Use and Land-Cover Over a District in Northern India. *Journal of the Indian Society of Remote Sensing*, 48, 525–534. <https://doi.org/10.1007/s12524-019-01095-2>

- Milojević, S., & Leydesdorff, L. (2013). Information metrics (iMetrics): A research specialty with a socio-cognitive identity? *Scientometrics*, 95(1), 141–157. <https://doi.org/10.1007/s11192-012-0861-z>
- Mishra, M., Desul, S., Santos, C. A. G., Mishra, S. K., Kamal, A. H. M., Goswami, S., Kalumba, A. M., Biswal, R., da Silva, R. M., dos Santos, C. A. C., & Baral, K. (2023). A bibliometric analysis of sustainable development goals (SDGs): a review of progress, challenges, and opportunities. *Environment, Development and Sustainability* 26:5, 26(5), 11101–11143. <https://doi.org/10.1007/S10668-023-03225-W>
- Mohanty, A., Priya, V. K., Paithe, U. N., & Mohanty, A. (2025). ‘E’ of Environmental, Social, and Governance (ESG) in India: reporting, review and future prospects. In *Discover Global Society* (Vol. 3, Number 1). Discover. <https://doi.org/10.1007/s44282-025-00288-0>
- Mukherjee, S., Aadhar, S., Stone, D., & Mishra, V. (2018). Increase in extreme precipitation events under anthropogenic warming in India. *Weather and Climate Extremes*, 20, 45–53. <https://doi.org/10.1016/j.wace.2018.03.005>
- Mushtaq, M., Malik, B. A., & Khan, N. (2024). Measuring the growth and impact of library and information science research in India: a multidimensional scientometric assessment. *Global Knowledge, Memory and Communication*. <https://doi.org/10.1108/GKMC-04-2023-0126>
- Mushtaq, S., Saleem, S., Ahmed, R., & Rather, G. M. (2024). Spatiotemporal Analysis Land Use Land cover changes in South Kashmir Region of North-western Himalayas Using Landsat data. *Discover Geoscience*, 2(July), 1–16. <https://doi.org/10.1007/s44288-024-00031-3>
- Ni, Z., Zhao, W., Yin, C., Meadows, M. E., & Pereira, P. (2025a). Mapping geography’s engagement with the Sustainable Development Goals: Research foci, contributions, and future directions. In *Geography and Sustainability* (Vol. 6, Number 6). Beijing Normal University Press. <https://doi.org/10.1016/j.geosus.2025.100376>
- Ni, Z., Zhao, W., Yin, C., Meadows, M. E., & Pereira, P. (2025b). Mapping geography’s engagement with the Sustainable Development Goals: Research foci, contributions, and future directions. *Geography and Sustainability*, 6(6), 100376. <https://doi.org/10.1016/J.GEOSUS.2025.100376>
- Nightingale, A. J. (2018). Geography’s contribution to the Sustainable Development Goals: Ambivalence and performance. *Dialogues in Human Geography*, 8(2), 196. <https://doi.org/10.1177/2043820618780790>
- Osman, M. A., Sheikh Farah, A. A., & Abdi, A. I. (2025). A bibliometric analysis of sustainable development research in higher education institutions (HEIs): key trends, global collaborations and influential contributions (2015–2023). *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2490436>
- Padmini, Y., Rao, M. S., & Rao, G. R. (2023). Temporal Analysis of Land Use and Land Cover Changes in Vizianagaram District, Andhra Pradesh, India using Remote Sensing and GIS Techniques. *Geopanning*, 10(1), 1–10. <https://doi.org/10.14710/GEOPLANNING.10.1.1-10>
- Pallayil, B., Joseph, J., Veluthedan, S., Siddique, S. M. M., Bhaskaran, A. K., & Maheswary, U. (2024). India’s Sustainable Development Goal Journey: Progress and Pathways. In *Studies in Systems, Decision and Control* (Vol. 535, pp. 423–437). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-3-031-63569-4_37
- Patra, P. K., Behera, D., & Goswami, S. (2022). Relative Shannon’s Entropy Approach for Quantifying Urban Growth Using Remote Sensing and GIS: A Case Study of Cuttack City, Odisha, India. *Journal of the Indian Society of Remote Sensing*, 50(4), 747–762. <https://doi.org/10.1007/s12524-022-01493-z>

- Patra, S., Sahoo, S., Mishra, P., & Chandra, S. (2018). Impacts of urbanization on land use /cover changes and its probable implications on local climate and groundwater level. *Journal of Urban Management*, 7(2), 70–84. <https://doi.org/10.1016/j.jum.2018.04.006>
- Patra, S., Sahoo, S., Mishra, P., & Mahapatra, S. C. (2018). Impacts of urbanization on land use /cover changes and its probable implications on local climate and groundwater level. *Journal of Urban Management*, 7(2), 70–84. <https://doi.org/10.1016/j.jum.2018.04.006>
- Pereira, P., & Zhao, W. (2025a). Geography and geographical knowledge contribute decisively to all sustainable development goals and targets. In *Geography and Sustainability* (Vol. 6, Number 1). Beijing Normal University Press. <https://doi.org/10.1016/j.geosus.2025.100267>
- Pereira, P., & Zhao, W. (2025b). Geography and geographical knowledge contribute decisively to all sustainable development goals and targets. *Geography and Sustainability*, 6(1), 100267. <https://doi.org/10.1016/J.GEOSUS.2025.100267>
- Philip, B., & Suresh, G. (2024). India's Agriculture Sector's Journey towards Sustainable Development Goals: Assessing Governmental Interventions and Sectoral Outcomes. *Universal Journal of Agricultural Research*, 12(2), 332–341. <https://doi.org/10.13189/ujar.2024.120212>
- Pramanik, S., & Punia, M. (2019). Land use/land cover change and surface urban heat island intensity: source–sink landscape-based study in Delhi, India. *Environment, Development and Sustainability*, 22(8), 1–26. <https://doi.org/10.1007/s10668-019-00515-0>
- Rafiq, M., Mishra, A. K., & Meer, M. S. (2018). On land-use and land-cover changes over Lidder Valley in changing environment. *Annals of GIS*, 24(4), 275–285. <https://doi.org/10.1080/19475683.2018.1520300>
- Rajasekhar, M., Raju, G. S., Raju, R. S., Ramachandra, M., & Kumar, B. P. (2019). Accuracy assessment of land use/land cover classification in parts of Kadapa district (Andhra Pradesh, India), using remote sensing and GIS. *Journal of Indian Geophysical Union*, 23(4), 356–366.
- Rajkumari, R., & Hussain, S. (2025). *A systematic literature review of land use and land cover dynamics in Manipur, India*. 3.
- Rasool, R., Shafiq, M., Ahmed, P., & Ahmad, P. (2018). An analysis of climatic and human induced determinants of agricultural land use changes in Shupiyan area of Jammu and Kashmir state, India. *GeoJournal*, 83(1), 49–60. <https://doi.org/10.1007/s10708-016-9755-6>
- Ruiz-Rosero, J., Ramirez-Gonzalez, G., & Viveros-Delgado, J. (2019). Software survey: ScientoPy, a scientometric tool for topics trend analysis in scientific publications. *Scientometrics*, 121(2), 1165–1188. <https://doi.org/10.1007/s11192-019-03213-w>
- S Jamal, W. A. A. A. S. (2019). Monitoring land use/land cover change detection and urban expansion with Remote Sensing and GIS techniques in Anantnag District of Kashmir Valley. *The Geographer*, 66(1), 60–69.
- Sam, S. C., & Balasubramanian, G. (2023). Spatiotemporal detection of land use/land cover changes and land surface temperature using Landsat and MODIS data across the coastal Kanyakumari district, India. *Geodesy and Geodynamics*, 14(2), 172–181. <https://doi.org/10.1016/j.geog.2022.09.002>
- Sansare, D. A., & Mhaske, S. Y. (2018). Analysis of land use land cover change and its impact on peak discharge of storm water using GIS and remote sensing: A case study of Mumbai city, India. *International Journal of Civil Engineering and Technology*, 9(11), 1753–1762.

- Sati, A. P., & Mohan, M. (2017). The impact of urbanization during half a century on surface meteorology based on WRF model simulations over National Capital Region , India. *Theor Appl Climatol*, 47(1–2), 309–323. <https://doi.org/10.1007/s00704-017-2275-6>
- Saxena, A., Ramaswamy, M., Beale, J., Marciniuk, D., & Smith, P. (2021). Striving for the United Nations (UN) Sustainable Development Goals (SDGs): what will it take? *Discover Sustainability*, 2(1). <https://doi.org/10.1007/s43621-021-00029-8>
- Selvam, S., Dar, F. A., Magesh, N. S., Singaraja, C., Venkatramanan, S., & Chung, S. Y. (2016). Application of remote sensing and GIS for delineating groundwater recharge potential zones of Kovilpatti Municipality, Tamil Nadu using IF technique. *Earth Science Informatics*, 9(2), 137–150. <https://doi.org/10.1007/s12145-015-0242-2>
- Shahfahad, Rihan, M., Naikoo, M. W., Ali, M. A., Usmani, T. M., & Rahman, A. (2021). Urban Heat Island Dynamics in Response to Land-Use/Land-Cover Change in the Coastal City of Mumbai. *Journal of the Indian Society of Remote Sensing*, 49(9), 2227–2247. <https://doi.org/10.1007/s12524-021-01394-7>
- Shanmugan, K., & Baria, B. P. (2019). Agricultural Labour Productivity and Its Determinants in India. *Indian Journal of Labour Economics*, 62(3), 431–449. <https://doi.org/10.1007/s41027-019-00180-x>
- Sharma, Arabinda., & Sinha, P. Nitin. (2023). *Geographical approaches for sustainable society and environment*. Kunal Books.
- Singh, A., Kanaujia, A., & Singh, V. K. (2022). Research on Sustainable Development Goals: How has Indian Scientific Community Responded? *Journal of Scientific and Industrial Research*, 81(11), 1147–1161. <https://doi.org/10.56042/jsir.v81i11.64456>
- Singh, A., Kanaujia, A., Vivek, &, & Singh, K. (2022). Research on Sustainable Development Goals: How has Indian Scientific Community Responded? *Journal of Scientific & Industrial Research*, 81, 1147–1161. <https://doi.org/10.56042/jsir.v81i11.64456>
- Singh, P., Kikon, N., & Verma, P. (2017a). Impact of land use change and urbanization on urban heat island in Lucknow city, Central India. A remote sensing based estimate. *Sustainable Cities and Society*, 32, 100–114. <https://doi.org/10.1016/j.scs.2017.02.018>
- Singh, P., Kikon, N., & Verma, P. (2017b). Impact of land use change and urbanization on urban heat island in Lucknow city, Central India. A remote sensing based estimate. *Sustainable Cities and Society*, 32, 100–114. <https://doi.org/10.1016/j.scs.2017.02.018>
- Singh, S., Bhardwaj, A., & Verma, V. K. (2020). Remote sensing and GIS based analysis of temporal land use/land cover and water quality changes in Harike wetland ecosystem, Punjab, India. *Journal of Environmental Management*, 262(10), 1–10. <https://doi.org/10.1016/j.jenvman.2020.110355>
- Srinivasa Rao, Y., & Jugran, D. K. (2003). Delineation of groundwater potential zones and zones of groundwater quality suitable for domestic purposes using remote sensing and GIS. *Hydrological Sciences Journal*, 48(5), 821–833. <https://doi.org/10.1623/hysj.48.5.821.51452>
- Sultana, S., & Satyanarayana, A. N. V. (2018). Urban heat island intensity during winter over metropolitan cities of India using remote-sensing techniques: impact of urbanization. *International Journal of Remote Sensing*, 39(20), 6692–6730. <https://doi.org/10.1080/01431161.2018.1466072>
- Sultana, S., & Satyanarayana, A. N. V. (2020). Assessment of urbanisation and urban heat island intensities using landsat imageries during 2000 – 2018 over a sub-tropical Indian City. *Sustainable Cities and Society*, 52(1), 1–14. <https://doi.org/10.1016/j.scs.2019.101846>

- Suresha, M. K., Joshi, H. G., & Joisa, J. (2025). Agri social entrepreneurship and rural transformation in Karnataka, India. *Discover Sustainability*, 6(1). <https://doi.org/10.1007/s43621-025-01886-3>
- Thoker, I. A., Bhat, M. S., Shah, S. A., Lone, F. A., Mir, S., Parrey, H. A., & Akbar, M. (2024). Towards sustainable forest management: an examination of environmental knowledge among forest dwellers in the Kashmir Himalayas. *Environment, Development and Sustainability*, 1–29. <https://doi.org/10.1007/s10668-024-04823-y>
- Umek, L. (2026). Biblium: a Python library for comparative bibliometric analysis. *Scientometrics*. <https://doi.org/10.1007/s11192-026-05636-8>
- Vaidya, P., Malik, B. A., & Ali, P. M. N. (2021). Characteristics and Trends in Literature of Library Service Quality as Reflected in Scopus. *Serials Librarian*, 81(2), 145–175. <https://doi.org/10.1080/0361526X.2021.1882642>
- van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>
- Vijay, R., Dey, J., Sakhre, S., & Kumar, R. (2020). Impact of urbanization on creeks of Mumbai, India: a geospatial assessment approach. *Journal of Coastal Conservation*, 24(1), 1–16. <https://doi.org/10.1007/s11852-019-00721-y>
- Wang, Q., & Huang, R. (2021). The impact of COVID-19 pandemic on sustainable development goals – A survey. *Environmental Research*, 202. <https://doi.org/10.1016/j.envres.2021.111637>
- Waza, A. U. D. (2023). Evaluating Changes in Vegetation and Non-Vegetation Patterns of Lidder Valley, Kashmir, India by Using Remote Sensing and GIS. *International Journal of Trend in Scientific Research and Development (IJTSRD)*, 7(3), 1361–1370. <https://doi.org/https://doi.org/10.5281/zenodo.824101>
- Waza, A. u D., Bhat, M. S., Pednekar, S., Rather, J. A., Rather, J. A., & Maqbool, S. (2026). Analysing land use/landcover changes in Southern India through ICA framework. *GeoJournal* 2026 91:2, 91(2), 62-. <https://doi.org/10.1007/S10708-026-11591-X>
- Waza, A. U. D., Ikram, M., Rayaz, K., Tandup, C., Pednekar, S., & Kannojiya, K. (2025). Estimation of Groundwater Potential Using Analytical Hierarchy Process (AHP): A Case Study of Kulgam District of Jammu and Kashmir , India. In S. Rani (Ed.), *Land and Water Nexus in South Asia. Advances in Asian Human* (pp. 387–405). Springer Berlin Heidelberg. https://doi.org/https://doi.org/10.1007/978-3-031-87429-1_14
- Waza, A. U. D., Malik, B. A., & Gavit, R. H. (2023). Dynamics of land use and land cover in Northern India: a systematic review. *GeoJournal*, 88(8), 4297–4324. <https://doi.org/10.1007/s10708-023-10870-1>
- Waza, A. U. D., Pednekar, S., Gadhe, U., & Tomar, Singh, Kumar, K. (2025). Dynamics of Land Use/Land Cover Transformation : A Geospatial Study of Lidder Watershed of Kashmir Valley ,. In S. Rani (Ed.), *Land and Water Nexus in South Asia. Advances in Asian Human* (pp. 212–226). Springer. https://doi.org/https://doi.org/10.1007/978-3-031-87429-1_7
- Yaseen, U., Devnita, R., Nurbaiti, A., Fitriatin, B. N., Siswanto, S. Y., & Dristiarini, R. Z. (2025). Soil erosion and food security in Asia’s most populous nations: a systematic review from China, India, and Indonesia. *Discover Soil*, 2(1). <https://doi.org/10.1007/s44378-025-00091-y>
- Zope, P. E., Eldho, T. I., & Jothiprakash, V. (2015). Impacts of urbanization on flooding of a coastal urban catchment: a case study of Mumbai City, India. *Natural Hazards*, 75(1), 887–908. <https://doi.org/10.1007/s11069-014-1356-4>

Zope, P. E., Eldho, T. I., & Jothiprakash, V. (2016). Impacts of land use-land cover change and urbanization on flooding: A case study of Oshiwara River Basin in Mumbai, India. *Catena*, 145, 142–154. <https://doi.org/10.1016/j.catena.2016.06.009>