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A Bibliometric Review of Sustainable Practices in Oil and Gas Sector: Analytics Perspective

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Abstract: Recently, the Indian Oil and Gas industry has been developing fast and plays a significant part in the Indian economy. Inspite of India having limited supplies of oil, the demand-supply is very high. To attain a better level in the petroleum industry for Indian investors, sustainable practices and Environmental, social, and governance (ESG) play a significant role. The oil and gas sector being a significant contributor to the global economy; it is also one of the most environmentally impactful industry. The adoption of sustainable practices and Environmental, Social, and Governance (ESG) principles is crucial for the industry to operate efficiently and responsibly. This study employs bibliographic research, with a thorough analysis of pertinent papers sourced from the Scopus database. Any investigation that necessitates gathering data from published materials is considered research. This bibliographic study provides descriptive details about a book, including the author, title, publishing date, and other relevant information. The analysis also makes it possible to map the discipline's boundaries and organizational framework, which helps identify the established patterns of international cooperation. The present research interests and possible future research directions are also identified by this study.

Keywords: Bibliometric analysis, Indian investors, Oil and gas sector, Prescriptive analytics, Predictive analytics, Hydrocarbons, sustainable practices, ESG, upstream, mid-stream, downstream

1. INTRODUCTION

In the global economy, the hydrocarbon industry is considered as an important sector that produces an estimated revenue of $5 trillion in 2022. Hydrocarbons are chemical organic compounds that occur naturally and form the basis of crude oil, gas coal, and other important resources [1]. The hydrocarbon industry is categorized into 3 types: upstream, midstream, and downstream. The upstream segment involves the exploration and acquisition of oil and natural gas resources [2]. Raw materials are transported to refineries as part of the midstream segment [3]. Converting raw resources into value-added end goods like fuels, polymers, and petrochemicals is the downstream segment's responsibility. [4]. Oil and gas are a main term that is utilized further in the hydrocarbon industry. The oil and gas industry has a profound impact on human activity daily as well as the economics of nations that produce and import oil. Applications of gas and oil have a direct impact on the expansion of industry globally, as seen by how simple transportation is on a local and international scale [5]. One of India's eight main sectors is the oil and gas industry. All other significant economic sectors' decision-making is significantly impacted by it [6]. Energy consumption and economic development are strongly related; therefore it is anticipated that demand for gas and oil will increase in the upcoming years. [7,8]. The Asia-Pacific region, which includes China, India, Indonesia, and other countries with the fastest-growing economies in the world, is primarily responsible for the increase in oil consumption over the period under review. [9, 10]. Multiple predictions indicate that by 2035, the oil consumption in the region will increase at an average annual rate of 1.8% to 1.5% due to the high rates of expansion of the vehicle and industry sectors. The annual oil consumption of the region is anticipated to increase by 530–770 million tons between 2012 and 2035, notwithstanding a slight decrease in oil consumption in affluent countries like Japan. [11, 12]. The draft of this paper is organized in a sketched diagrammatic format, which is shown in below Figure 1.

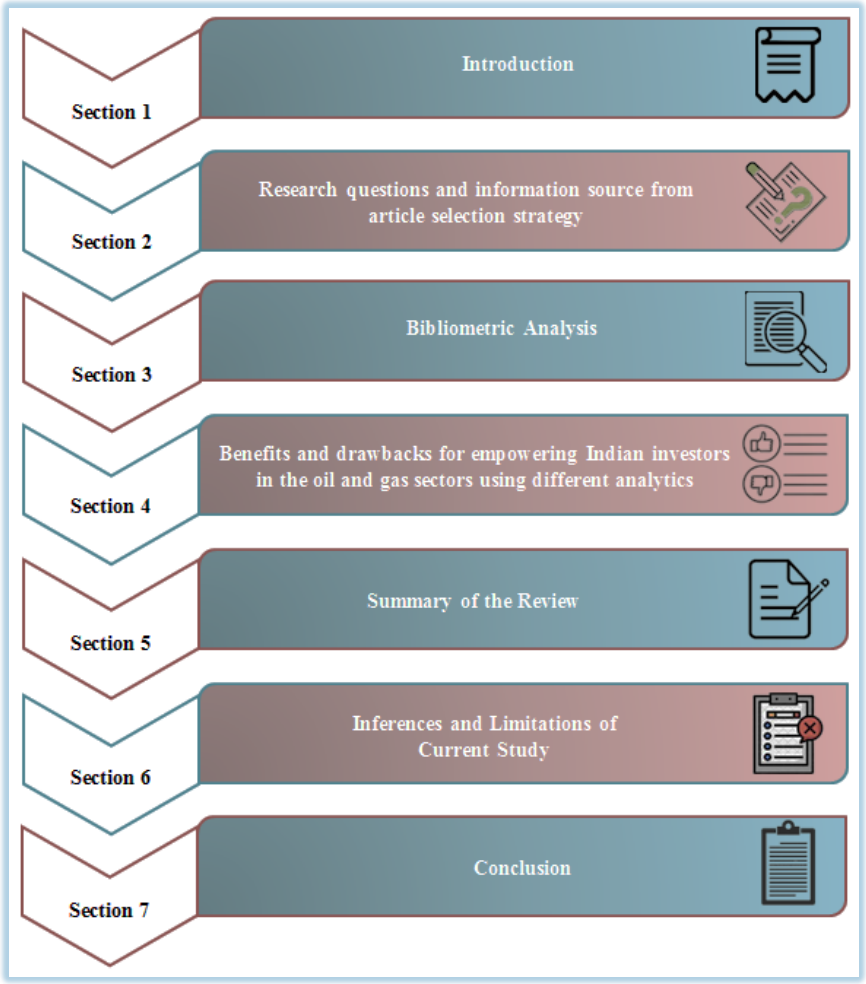

Figure 1: Framework of the paper

Thus, investors and management can decide whether to hedge based on whether the exposure to oil price changes is economically substantial by assessing how a change in oil price will affect a company's share prices. [13, 14]. Investors utilize the Environmental, Social, and Governance (ESG) framework to assess the ethical implications and long-term viability of a firm investment. Non-financial measurements called ESG factors are used to evaluate the ethical and sustainable impact of a corporation. Corporate governance, social responsibility, and the environment are some of these factors. Prescriptive and predictive analytics are two more forms of analytics that are crucial for anyone investing in the oil and gas industry [15, 16]. Predictive analytics has been adopted by the Indian oil business sector with the aim of enhancing production and monitoring parameters [17]. These analytics could reduce runtime, improve safety, and enhance industry operations' dependability and efficiency [18]. Prescriptive analytics can help investors in the oil and gas industry make well-informed decisions by offering useful information on supply chains, output, and other important areas [19, 20].

2. RESEARCH QUESTIONS AND INFORMATION SOURCE FROM ARTICLE SELECTION STRATEGY

The research question will assist in establishing the context for what has to be researched and what is the aim to discover, thereby contributing to the current work with a well-defined target to attain. Additionally, it is required that the selection criteria should be applied to both peer-reviewed and non-peer-reviewed submissions; thus, it is crucial to frame the key variations between them.

2.1. Research Questions

The following research questions are explicitly addressed in the study:

- **RQ1:** What are the keywords utilized for locating the document for the research?
- **RQ2:** How many journals were taken into consideration for the Bibliometric analysis?
- **RQ3:** Totally, how many papers were taken from the journals?
- **RQ4:** Who are the top 25 authors having higher citations?
- **RQ5:** What are the benefits and drawbacks for Indian investors in the oil and gas sectors?

2.2. Article selection strategy

The Scopus research databases were the source of the bibliometric data, which were collected between 2013 and 2023. The greatest abstract and citation database for books, conference proceedings, and peer-reviewed scientific journals is regarded as Scopus. Using the "title, abstract, keywords" search in the WOS, Scopus database, and SCIE, the data were collected. The Scopus database encompasses numerous performance-related articles focusing on accurately empowering Indian investors in the oil and gas sector by utilizing ESG and sustainable practices. These databases have been carefully chosen due to their academic reliability and the the wide spectrum of journal articles offered within the respective disciplines. From 25 reputed journals, about 621 papers had been taken for the analysis. After knowing the inclusion criteria, the next step is to apply the exclusion criteria. An exclusion criterion is that only Scopus database indexes have been taken and most research papers focused on the analysis over the last 10 years.

3. INTRODUCTION TO BIBLIOMETRIC ANALYSIS

The research on oil & gas, ESG, and sustainable practices was quantitatively and qualitatively analyzed through normal data analysis. For normal data analysis, bibliographic measures like journals, countries, authors, scientific papers, and publishers were utilized. The bibliographic research uses citations to recognize the worthiest papers, researchers, and journals enclosed by certain domains. This section also analyzed the important analysis like initial search, exploratory data, geographic location, subject area, network analysis, affiliations-based analysis, source types, publication citations, source titles, and funding sponsors.

3.1. Keyword analysis

Essential terms for any kind of study are keywords. The research's conclusions heavily rely on the keywords. To find the documents that best fit the theme of this work, the following common keywords were used: "Oil and gas sector analysis," "Predictive analytics," "Prescriptive analytics," "Oil and Gas Investments," "Organization of the Petroleum Exporting Countries (OPEC)," "ESG," and "sustainable practices." After all journals related to the primary keywords were analyzed, 25 reputable journals were selected as the best fit for bibliometric research in this study.

3.2. Metric Analysis of the Journals

Numerous journals are dedicated to the study of empowering Indian investors in the gas and oil industry. Using metrics like impact factor (IF), Scimago Journal Rank (SJR), Source Normalized Impact per Paper (SNIP), Citation score (CS), country, publication frequency (PF), and publisher, 25 journals were included in the analysis. Consequently, table 1 shows the metrics-based analysis of journals for the study of utilizing ESG and sustainable practices to empower Indian investors in the oil and gas industry.

Table 1: Metric Analysis of journals for the research of empowering Indian investors in the oil & gas sector by using ESG and sustainable practices

Journal name	IF	SJR	CS	SNIP	Publisher	Country	PF
Energy Economics	12.54	3.3	14.7	2.62	Elsevier	Netherlands	Bi-Monthly
Energy and AI	11.25	1.89	11.8	1.89	Elsevier BV	Netherlands	Quarterly
Resources Policy	10.59	1.86	11.3	2.00	Elsevier Ltd.	United Kingdom	Quarterly
Energy Strategy Reviews	9.17	2.06	15.1	2.83	Elsevier	Netherlands	Quarterly
Environmental Impact Assessment Review	8.67	1.36	9.4	1.79	Elsevier	Netherlands	Bi-Monthly
Climate Policy	7.75	2.41	11.9	2.00	Taylor & Francis	United Kingdom	272 Days
Petroleum Exploration and Development	6.83	1.43	8.2	2.41	Elsevier	Netherlands	Quarterly
Environmental Science and Pollution Research	6.18	0.94	7.9	1.21	Springer Science + Business Media	Germany	Bi-Monthly
Energy Reports	6.11	0.97	5.6	1.54	Elsevier Ltd.	United Kingdom	16 Weeks
Environmental Politics	5.86	1.85	9.6	2.13	Routledge	United Kingdom	Seven Times a Year
Journal of Petroleum Science and Engineering	5.44	1.11	8.8	1.74	Elsevier	Netherlands	Quarterly
Eurasian Geography and Economics	5.23	1.12	8.8	2	Taylor and Francis Ltd.	United Kingdom	Bi-Monthly
Journal of Environmental Planning and Management	4.58	0.89	7.1	1.20	Routledge	United Kingdom	Monthly
Petroleum Research	4.39	0.67	4.6	1.19	KeAi Communications Co.	China	Quarterly
Sustainability	4.39	0.66	5.8	1.19	MDPI AG	Switzerland	Semi-Monthly
Petroleum	4.26	0.7	8.5	1.82	KeAi Communications Co.	China	Quarterly

The Extractive Industries and Society	3.43	0.92	6.3	1.27	Elsevier BV	Netherlands	Quartely
Energies	3.252	0.63	5.5	1.02	Multidisciplinary Digital Publishing Institute (MDPI)	Switzerland	Semi-Monthly
Current Sustainable/Renewable Energy Reports	2.76	0.62	5.2	0.69	Springer Nature Switzerland AG	Switzerland	Quarterly
Journal of Petroleum Exploration and Production Technology	2.74	0.53	5	1.11	Springer Verlag	Germany	13 Weeks
OPEC Energy Review	2.5	0.36	2	0.58	Wiley-Blackwell	United States	Quarterly
Safety	1.95	0.39	3.3	0.89	Multidisciplinary Digital Publishing Institute (MDPI)	Switzerland	Quarterly
Procedia Manufacturing	1.5	0.51	1.9	1.39	Elsevier BV	Netherlands	Quarterly
Journal of Asian Finance Economics and Business	1.11	0.22	0.5	1.03	Korea Distribution Science Association	Republic of Korea	Quarterly
The Journal of World Energy Law & Business	0.42	0.17	0.8	0.22	Oxford Press	United States	Bi-Monthly

From Table 1, it has been found that each journal is from a different country like the United Kingdom (UK), United States (US), Netherlands, and Germany. The journals were based on ranking priority of impact factor from high to low. Out of all the other mentioned journals, Energy Economics indicates the highest IF of 12.54 with its SJR and SNIP of 3.3 and 2.62, respectively. There were many publishers for the journals like Elsevier BV, MDPI AG, Springer Verlag, Korea Distribution Science Association, etc. With an effect factor of 11.25, the Energy and AI ranked second, with SNIP and SJR ratings of 1.89 and 1.89, respectively. In the Journal of World Energy Law & Business Journal, the IF measure was 0.42, which was lower.

3.3. Initial search results

Language is seen as a crucial component of an organized communication system. A language's grammar makes up its structure, while its vocabulary makes up its free parts. Humans communicate primarily through languages, which can be expressed by written, spoken, or sign language. Figure 2 is an analysis of the terminology used in standard publications related to the work theme over the past ten years.

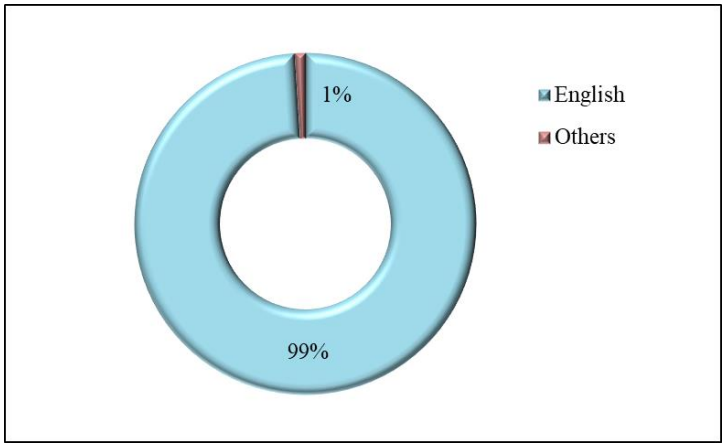

Figure 2: Pie chart of language utilized in standard publications associated with the theme of work for the last 10 years

It is clear from Figure 2 that the English language completely dominated the standard publications between the years 2013 to 2022 for the research of empowering Indian investors in the oil & gas sector using ESG. In other languages, the standard publication was only 1%.

3.4. Exploratory data highlights

Using ESG and sustainable practices, a variety of research projects have been undertaken with the goal of empowering Indian investors in the oil and gas sector. Most accomplished authors from various nations have published these research projects. The publication count column is shown in tables as 2013 to 2016, 2017 to 2019, and 2020 to 2023. Table 2 describes the number of publications counts for empowering Indian investors in the oil & gas sector using ESG and sustainable practices between the years 2013 to 2023.

Table 2: Number of publications counts for empowering Indian investors in the oil & gas sector using ESG and sustainable practices between the years 2013 to 2023

Journal name	2013 to 2016	2017 to 2019	2020 to 2023
Energy Economics	13	10	12
Energy and AI	0	0	5
Resources Policy	15	9	10
Energy Strategy Reviews	3	9	11
Environmental Impact Assessment Review	2	1	1
Climate Policy	1	3	5
Petroleum Exploration and Development	12	8	16
Environmental Science and Pollution Research	11	6	10
Energy Reports	7	8	17
Environmental Politics	2	5	2
Journal of Petroleum Science and Engineering	16	13	10
Eurasian Geography and Economics	1	2	1
Journal of Environmental Planning and Management	3	2	1

Petroleum Research	1	0	8
Sustainability	10	8	13
Petroleum	17	18	25
The Extractive Industries and Society	18	16	15
Energies	21	20	23
Current Sustainable/Renewable Energy Reports	6	4	1
Journal of Petroleum Exploration and Production Technology	6	10	15
OPEC Energy Review	28	14	12
Safety	0	2	7
Procedia Manufacturing	7	11	3
Journal of Asian Finance Economics and Business	1	1	2
The Journal of World Energy Law & Business	9	5	1

The above table 2 displays the published journal based on the research on empowering Indian investors in the oil & gas sector using ESG and sustainable practices between the years 2013 to 2023. When compared with all the other journals, "Energies" published the highest number of articles in the year 2013 to 2022 with a total count of published articles being 64. "Petroleum" obtained the 2nd highest number of published articles during the year 2013 to 2022. Furthermore, the journal "OPEC Energy Review" obtained the 3rd highest position in publishing articles with a count of 54. Further, the journal "Eurasian Geography and Economics" and "Environmental Impact Assessment Review" attained the lowest position, and the total of published articles based on the applied research in this journal was 4. Totally, 621 papers have been taken. The reference papers used in the analysis have been cited in the reference part. For instance, reference no [21 to 25] comes under different journals like the Journal of Petroleum Exploration and Production Technology, Current Sustainable/Renewable Energy Reports, Sustainability and Petroleum Research. These references (21 to 25) had been shown in the reference section. Likewise, reference [26 to 45] also comes under journals like Eurasian Geography and Economics, Environmental Politics, Energy Economics, Resources Policy, Environmental Science and Pollution Research, etc. These references are also shown in the reference section.

Most of the contributors come from different places. Thus, the pie chart in Figure 3 provides additional analysis of the percentage of a nation where the number of writers has more citations.

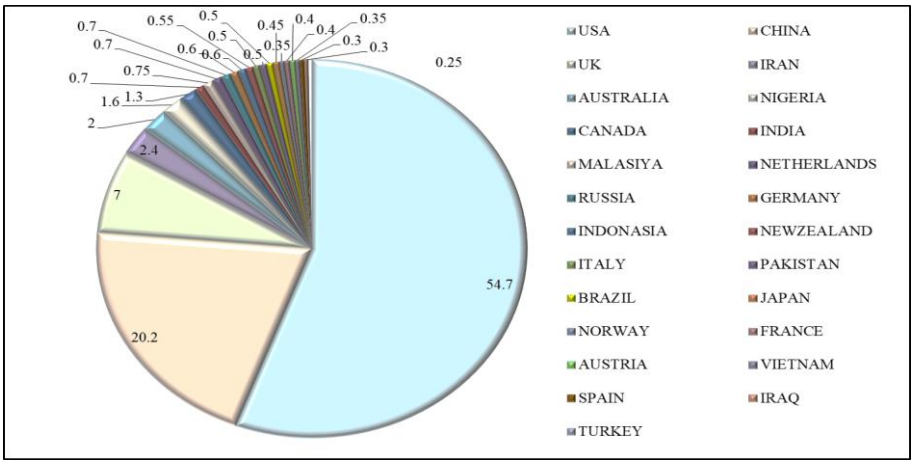

Figure 3: Countries with the percentage where the authors are having higher citations

From Figure 3, authors of the country USA had a higher percentage (54.70%) of citations when compared with the other countries. 2nd position was achieved by the authors from the country China with a percentage of 20.20%. UK country authors achieved the 3rd position with 7%. Surprisingly, it was found that turkey authors attained the last position with a percentage level of 0.25%.

3.5. Analysis by geographic location

The geographical distribution of the authors country-wise for the research of empowering Indian investors in the oil & gas sector using ESG and sustainable practices between the years 2013 till 2022 has been studied. A map chart called a geographic distribution can be used to display how data have been distributed over various locations by using shaded areas. Greater emphasis on values is indicated by a darker region. Based on studies on enabling Indian investors in the oil and gas sector through the use of ESG and sustainable practices, the geographical distribution of the list of authors' nations has been examined in Figure 4. A list of journal countries based on the research on empowering Indian investors in the oil & gas sector using ESG and sustainable practices has been examined in Figure 5.

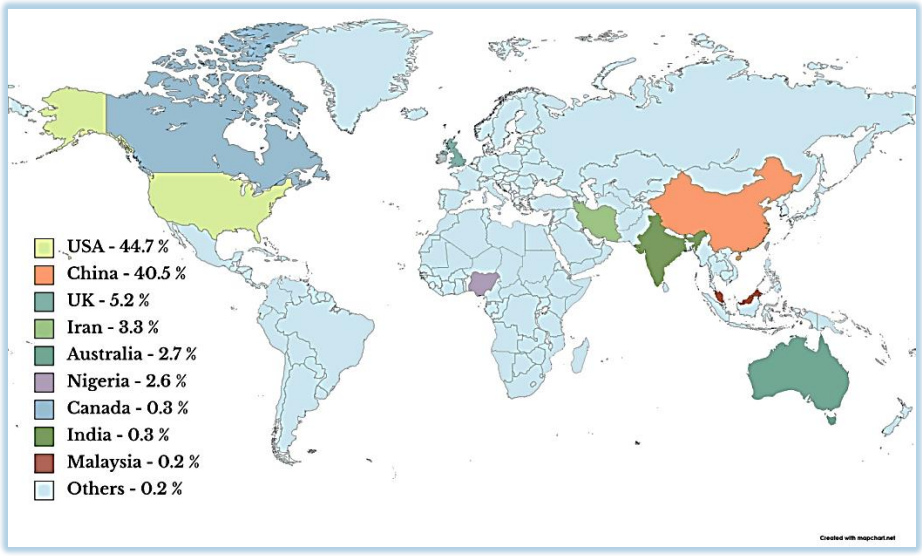

Figure 4: The author's list of countries is arranged geographically according to research on enabling Indian investors in the oil refining industry through the use of ESG and sustainable practices

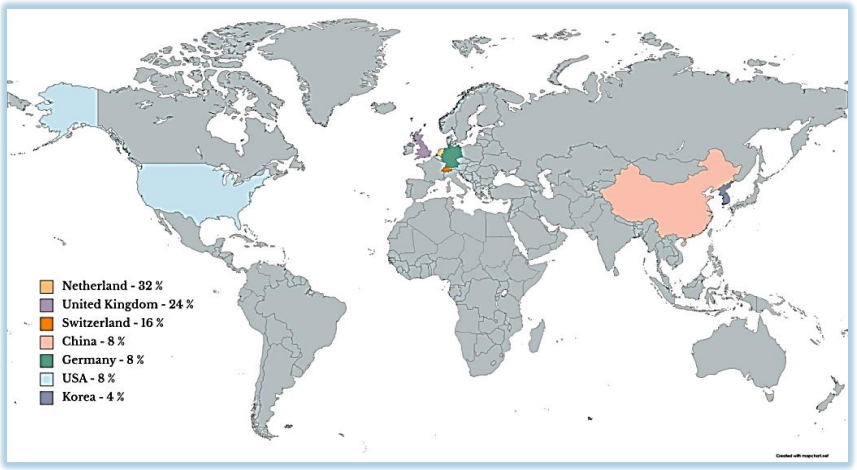

Figure 5: Geographical distribution of the journal's list of nations based on studies on utilizing ESG and sustainable practices

The author's countries include the US, UK, India, Canada, Nigeria, China, Australia, Malaysia, and others. From Figure 4, it was noted that more authors have participated in the research. 44.7 % of the authors from the USA had done research on empowering Indian investors in the oil & gas sector using ESG and sustainable practices, which is a higher percentage when compared with the other mentioned countries. The second position was attained by the China country with a percentage of about 40.5%. Surprisingly, 0.3% of the authors from India have done research on empowering Indian investors in the oil & gas sector using ESG and sustainable practices. It is understood that only a few authors from India have contributed to the research of empowering Indian investors in the oil & gas sector using ESG and sustainable practices.

The journal's countries include the US, UK, Germany, Netherlands, and others. From Figure 5, it is found that from more countries, journal publications have been done for the research. The Netherlands holds the highest percentage of 32% for having the journal based on the research of empowering Indian investors in the oil & gas sector using ESG and sustainable practices. Surprisingly, the 2nd place was attained by the country UK with 24%. Switzerland achieved the 3rd position with a percentage of 16%.

3.6. Subject area analysis

A subject area is a gathering of data pieces obtained from the transactional database that relate to each other in a particular context. Among different analyses, subject area analysis is the most significant to analyze because, in the research of empowering Indian investors in the oil & gas sector using ESG and sustainable practices, there will be more subjects like Petroleum engineering, Chemical engineering, Environmental health engineering, and others. Figure 6 explains the graphical representation of subject area-wise classification for empowering Indian investors in the oil & gas sector using ESG and sustainable practices.

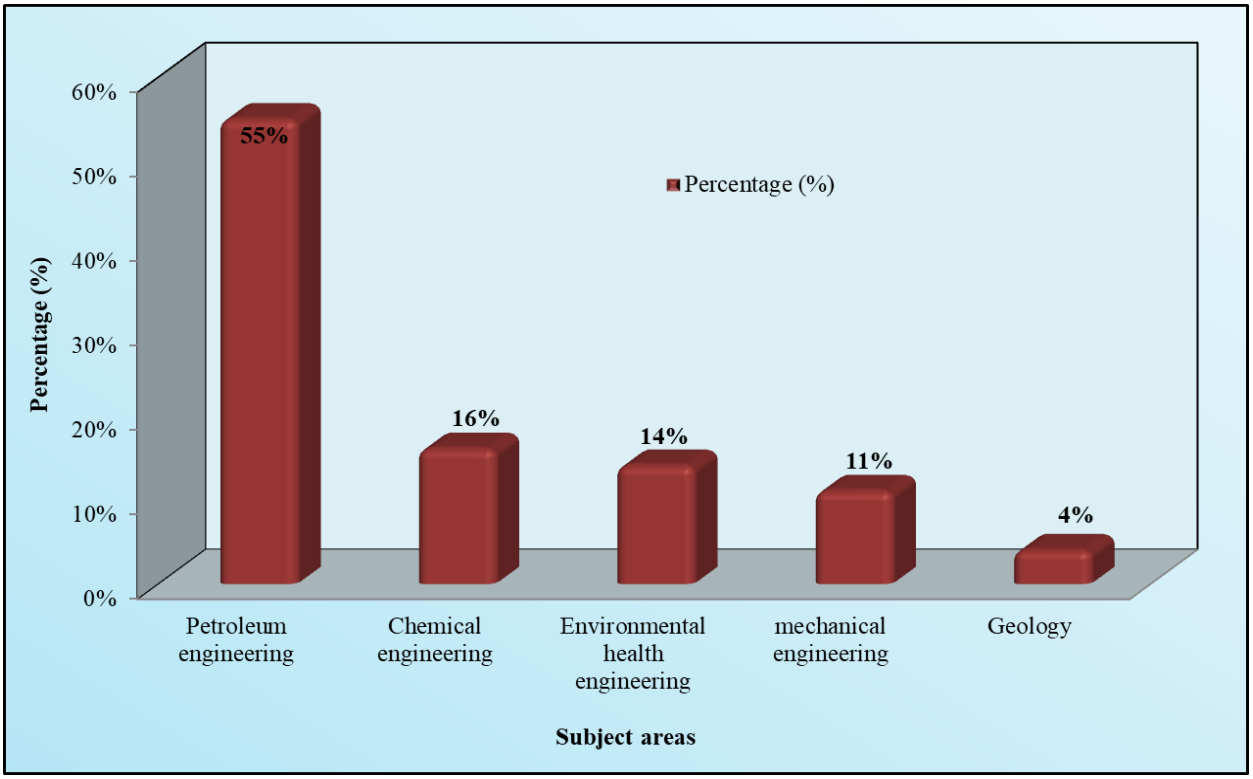

Figure 6: Using ESG and sustainable practices, a graphical depiction of topic area classification

It is evident from Figure 6 that the subject that covered more research on empowering Indian investors in the oil & gas sector using ESG and sustainable practices is Petroleum engineering with 55%. The Chemical Engineering subject is found to be the 2nd highest percentage (16%) for the research of empowering Indian investors in the oil & gas sector using ESG and sustainable practices. Among the subjects like Petroleum engineering, Chemical engineering, Environmental health

engineering, Mechanical engineering, and Geology, Geology showed the lesser percentage (4%) because it is less associated with the title empowering Indian investors in the oil & gas sector using ESG and sustainable practices.

3.7. Network Analysis

A graph-based representation that shows the relationships between various attributes is called network analysis. To perform network analysis, a variety of software platforms are available. The primary goal of this analysis is to illustrate the relationship between different computable properties. Nonetheless, the network analysis graphs in this study work are rendered using VOS viewers. The network analysis diagram based on keywords that concentrated on the oil and gas, analytics, and sustainability sectors is explained in Figure 7.

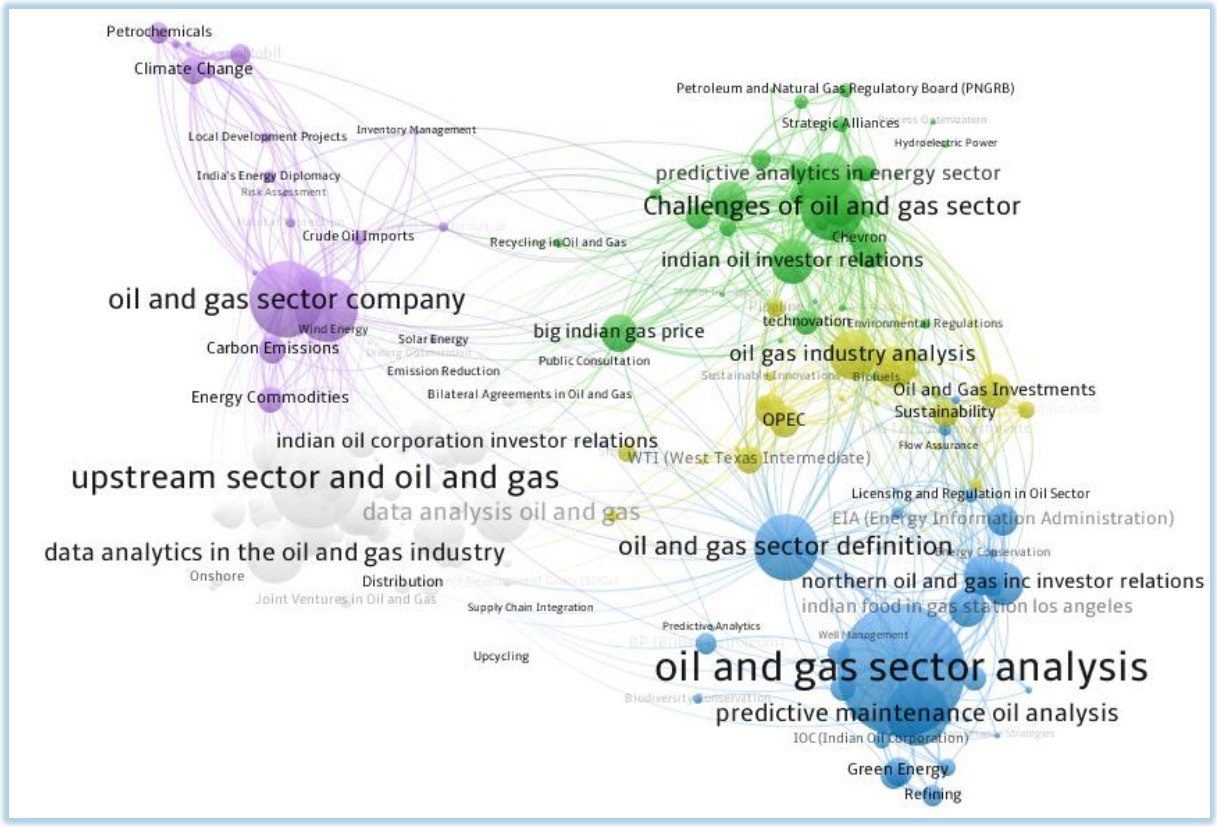

Figure 7: Network analysis diagram which focused on sustainability, analytics and oil and gas sector based on keywords.

Figure 7 made it clear that the names in the map circles correspond to the research keywords. The distance between two keywords is indicated by the links connecting the circles. The correlation between terms would be higher if the relation size was smaller. Five different colors were utilized to represent the five clusters. For 214 terms, the relevance score is computed. In order to create a network analysis based on keywords, 214 keywords were selected.

Additionally, the network analysis of writers must be examined following the network analysis of keywords. A significant group of writers has high bibliographic coupling indices. An in-depth analysis of the author sample indicates that writers are concentrated in this main cluster. Figure 8 presents the network analysis based on the authors' findings.

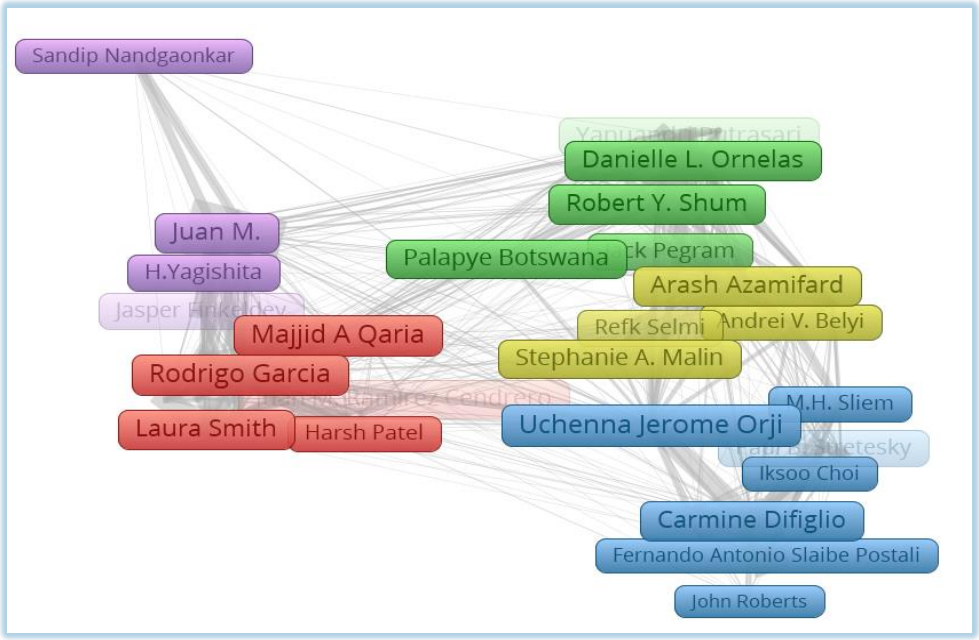

Figure 8: Network analysis that, according to the writers, concentrated on analytics, sustainability, and the petroleum industry

Figure 8 makes it evident that the writers are displaying combinational work. The writers' combined efforts on the released documents are described by the interconnectivity. A total of five colors were employed in the research investigation, which was akin to a keyword analysis. When the author's threshold value—which has a minimum of three documents—was manually set to three, the outcome was 60 authors.

3.8. Analysis based on Affiliations

Determining the affiliation data automatically is quite challenging and needs a substantial effort for data extraction, data cleaning, and matching heterogeneous representations of the same affiliations. Figure 9 explains the statistical analysis by affiliation based on the percentage of publication count.

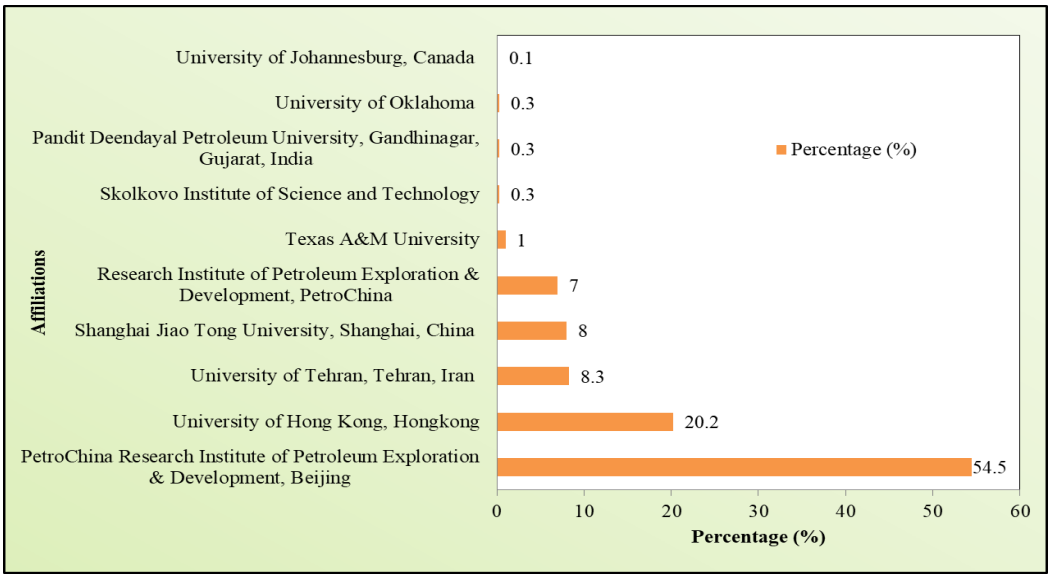

Figure 9: Statistical analysis by affiliation based on the percentage of publication count

From Figure 9, it is found that the PetroChina Research Institute of Petroleum Exploration & Development, Beijing, completely dominates the other universities with a high percentage of about 54.5. Following this, the University of Hong Kong, Hong Kong, attained the 2nd position with a higher percentage of 20.2. 3rd position was attained by the University of Tehran, Tehran, Iran, with a percentage of 8.3.

3.9. Analysis based on Source Types

A bibliography used to contain listings of books, essays, and articles; however, these days, if a website, video, or other multimedia source is viewed during research, it should be referenced in the bibliography. For the analysis of empowering Indian investors in the oil & gas sector using ESG and sustainable practices, different sources like conferences, journals, and books were utilized. Figure 10 explains the statistical analysis based on source types.

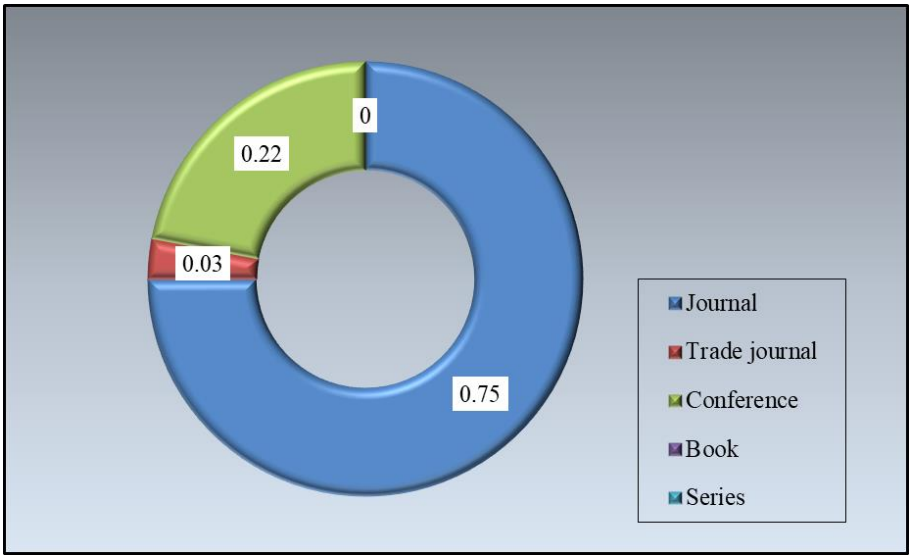

Figure 10: Analysis based on source types

It is evident from the Scopus extraction of the literature on enabling Indian investors in the oil and gas sector using ESG and sustainable practices that 22% of the publications are conference proceedings and 75% of the publications are journal proceedings. It has been noted that there are just 3% of book publications on the topic of empowering Indian investors in the oil and gas industry using ESG and sustainable practices.

3.10. Analysis based on publication Citations

Author credentials are the training, expertise, and/or personal history that qualify an author to write or speak on a certain subject. The top 25 authors from the 621 papers that were submitted are displayed in this section. The top 25 authors and their citations are presented in Table 3.

Table 3: Top first 25 authors and the citations

AUTHOR NAME	TITLE	YEAR	FINDINGS	AUTHOR CITATION	JOURNAL NAME
ZOU, et.al.[46]	Formation, distribution, resource potential, and discovery of Sinian—Cambrian	2014	The deep Anyue Sinian-Cambrian huge primary oil-cracking gas field in the Sichuan Basin was discovered to be the first in the world's ancient strata	560	Petroleum Exploration And Development

	giant gas field, Sichuan Basin		research, according to analysis. This finding served as a major source of inspiration for the expansion of oil and gas discoveries for middle-deep formations worldwide.		
Olabanji, et.al.[47]	The role of non-renewable energy consumption in economic growth and carbon emission: Evidence from oil-producing economies in Africa	2020	According to the results, the impact of a decrease in the consumption of natural gas and petroleum was determined to be comparable to that of a rise in Egypt and Nigeria.	317	Energy Strategy Reviews
WANG, et.al.[48]	Assessment of global unconventional oil and gas resources	2016	The results indicated that the development of unconventional oil and gas resources might concentrate on tight oil in the West Siberian and Neuquén basins and heavy oil in the Arab Basin.	269	Petroleum Exploration And Development
Maciej, et.al.[49]	Cost analysis of oil, gas, and geothermal well drilling	2014	When comparing the normalized costs of recently drilled wells with those of historical wells and WellCost Lite projections, the cost escalation rates of geothermal wells were much lower than those of hydrocarbon wells.	251	Journal of Petroleum Science and Engineering
Muhammad, et.al.[50]	Effect of energy consumption and economic growth on carbon dioxide emissions in Pakistan with dynamic ARDL simulations approach	2019	The results of the dynamic ARDL analysis showed that the use of coal, oil, and natural gas, as well as economic expansion, all had a beneficial effect on environmental degradation.	247	Environmental Science and Pollution Research
SUN, et.al.[51]	Development characteristics and orientation of tight oil and gas in China	2019	The results showed that if the subsidy was set at 0.6 yuan/m3, the low-abundance type II reserve area could be established to raise production to 600 x 108 m3 /a.	237	Petroleum Exploration And Development

Matthias, et.al.[52]	The renewable energy strategies of oil majors – From oil to energy?	2019	The investigation showed a substantial correlation between their policies for renewable energy and their mostly proven oil reserves.	236	Energy Strategy Reviews
Abass, et.al.[53]	oilfield scale management technology for oil and gas production	2015	The best management program, according to the results, lowers the output of hydrocarbons and lowers the cost of controlling scale deposits, preserving the operations' financial stability.	230	Journal of Petroleum Science and Engineering
Amy, et.al.[54]	Dynamic capabilities in the upstream oil and gas sector: Managing next-generation competition	2014	The findings demonstrated that strategic agility, which is essential for grasping and capitalizing on opportunities in the changing business environment, was sharpened by strong dynamic capabilities.	220	Energy Strategy Reviews
Mehdi, et.al.[55]	Big Data analytics in oil and gas industry: An emerging trend	2020	It was discovered that despite the recent increase in interest from the oil and gas sector in using big data analytics, there were still difficulties, mostly because of a lack of business support.	217	Petroleum
Daniel, et.al.[56]	The successful development of gas and oil resources from shales in North America	2018	The Qiongzhusi Formation and Longmaxi Formation in south-central China, which are rich in organic matter, were found to be more conducive to development. In addition to having a lot of gas, the Sichuan basin was close to many Chinese cities.	216	Journal of Petroleum Science and Engineering
Anirbid, et.al.[57]	Application of machine learning and artificial intelligence in oil and gas industry	2021	Numerous such solutions that make use of supervised learning, ANN, ALM, fuzzy logic, linear regression, and PCA might be implemented to address a variety of issues encountered in the oil and gas sectors and aid in the development of successful strategies.	211	Petroleum Research

Muili, et. al.[58]	Emergence of nanotechnology in the oil and gas industry: Emphasis on the application of silica nanoparticles	2017	The technology that emerged from the combined research strengthened the use of nanotechnology in the oil and gas sector both now and in the future, particularly for high-pressure and high-temperature (HPHT) applications.	189	Petroleum
Tatevik, et.al.[59]	Interdependence of oil prices and stock market indices: A copula approach	2014	Results indicated that investors had additional alternatives to assess the degree of interconnectedness between the two series.	187	Energy Economics
Tong, et al.[60]	Distribution and potential of global oil and gas resources	2018	There were 4209.4×108 of recoverable unconventional oil and 195.4×1012 m3 of recoverable unconventional natural gas in the world.	185	Petroleum Exploration And Development
Shelly, et.al.[61]	Returns and volatility linkages between international crude oil price, metal and other stock indices in India: Evidence from VAR-DCC-GARCH models	2016	The study's findings demonstrated that investors should always take dynamic volatility into account when trying to diversify their holdings.	180	Resources Policy
Mandadige, et.al.[62]	CO_2-Enhanced Oil Recovery with a Simulated Sensitivity Analysis	2016	The distance between the flood wells, the volume of the flood, and the rate at which CO2 is injected all have about similar effects on oil production, with the water injection rate having the least effect.	178	Energies
Mazhar,et.al.[63]	Current scenario of wind energy in Pakistan challenges and future perspectives: A case study	2016	Results indicated that wind zones with 2.1 GWh units were selected, and during the summer's peak demand, from April to September, one station provided the most power.	150	Energy Reports
Christopher, et. al.[64]	The potential role of natural gas flaring in meeting greenhouse	2018	An analysis revealed that, with gas flaring reductions, Gabon (94%), Algeria (48%),	148	Energy Strategy Reviews

	gas mitigation targets		Venezuela (47%), Iran (34%), and Sudan (33%), had achieved a significant amount of their NDC targets.		
HU, et.al.[65]	Trend and progress in global oil and gas exploration	2013	The Sahara Desert's Libya, Algeria, and a few other nations have demonstrated notable oil production, according to the results. In the Tarim Desert's interior, China has developed the Taizhong oilfield.	147	Petroleum Exploration And Development
Dmitry,et. al.[66]	Artificial intelligence in oil and gas upstream: Trends, challenges, and scenarios for the future	2021	Based on research, it was determined that the prediction was as straightforward as the oil century ending in 20–30 years because the margins across the entire upstream domain were continuously declining.	136	Energy and AI
Seyed,et.al.[67]	Forecasting of CO2 emissions in Iran based on time series and regression analysis	2019	Analysis revealed that, given the BAU's presumptions, Iran is unlikely to fulfill its commitment to the Paris Agreement.	133	Energy Reports
Emma, et.al.[68]	What is the social license to operate? Local perceptions of oil and gas projects in Russia's Komi Republic and Sakhalin Island	2015	Because of the concentration of power in Usinsk, social licenses were greatly impacted by the decisions made by residents of a town where a large proportion of foreigners employed in the oil business lived.	129	The Extractive Industries and Society
Jasper, et.al.[69]	Oil wealth and the well-being of the subaltern classes in Sub-Saharan Africa: A critical analysis of the resource curse in Ghana	2014	It becomes evident that there was a genuine risk of a resource curse known as "epidemic surfacing" in Ghana.	127	Resources Policy
SONG, et.al.[70]	Progress and development trend of unconventional	2017	The field of unconventional oil and gas geology has evolved from the detection of nanopores to the quantitative	124	Petroleum exploration and development

	oil and gas geological research		full-scale and three-dimensional characterization of pore structures. Discussions shifted from studying the macroscopic occurrence state to the microscopic occurrence state.		

The top 25 authors with higher citations were from journals like Petroleum Exploration and Development, Resources Policy, The Extractive Industries and Society, Energy and AI, etc. From Table 3, it is shown that author Zou had the highest number of citations (560) from the year 2014 and belongs to the Journal of Petroleum Exploration and Development. 2nd position was attained by Olabanji with several citations of 317 and it belongs to the journal of Energy Strategy Reviews. 3rd position was achieved by the author WANG with a number of citations of 269 and it belongs to the journal of Petroleum Exploration and Development. Surprisingly, the top 1 and 3 authors' work belongs to the same journal (Petroleum Exploration and Development). Among these top 25 authors, the least cited (124) author was Song.

3.11. Analysis based on source Titles

For most sources, source titles are clearly visible and typically appear next to the author's name. The graphical depiction of analysis based on source titles is explained in Figure 11.

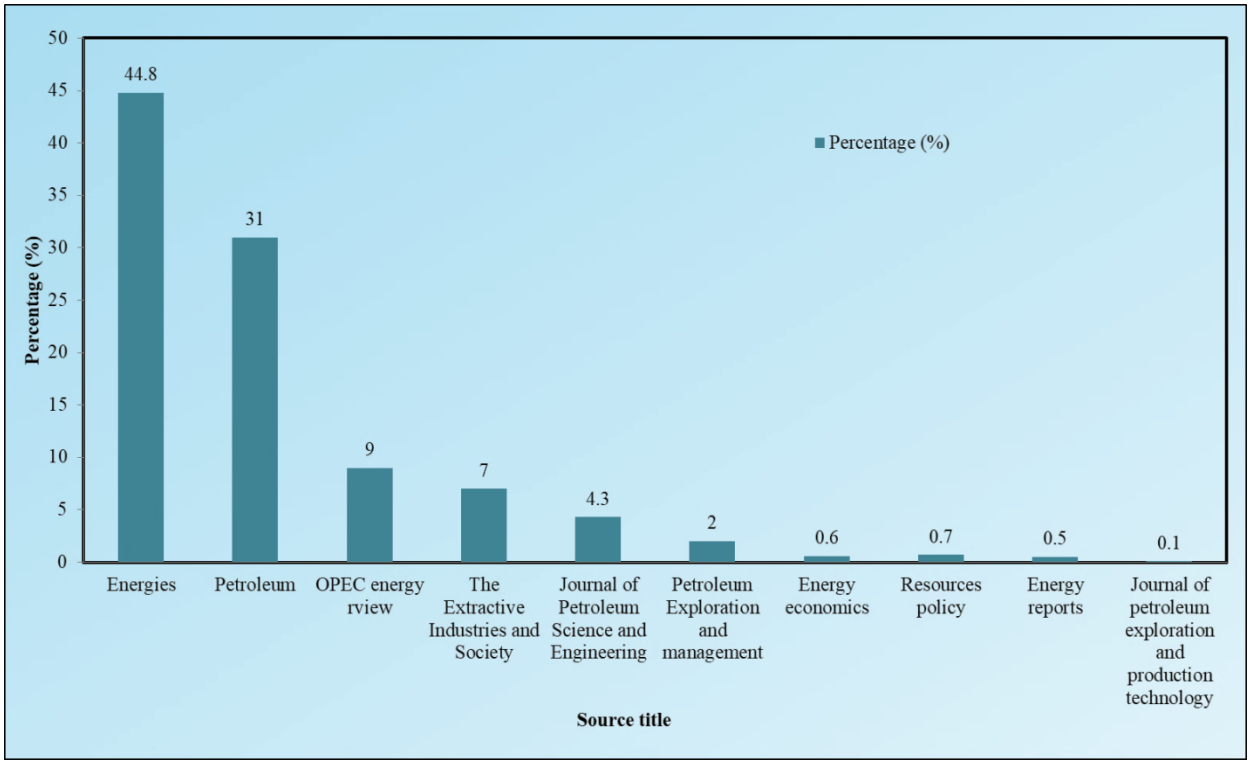

Figure 11: Statistical analysis represented graphically based on the titles of the sources

From Figure 11 it is observed that maximum number of publications are done in the source title “Energies”. This journal completely dominated the other journals. The 2nd place was attained by the source title "Petroleum" with 31%. The lesser percentage of publication count was in the source titles like energy reports and Journal of Petroleum Exploration and Production Technology.

3.12. Analysis based on funding Sponsors

Figure 12 displays statistical analysis based on financing sponsors in enabling Indian investors in the oil and gas sector using ESG and sustainable practices. Based on the facts, the top 10 funding sponsors are considered.

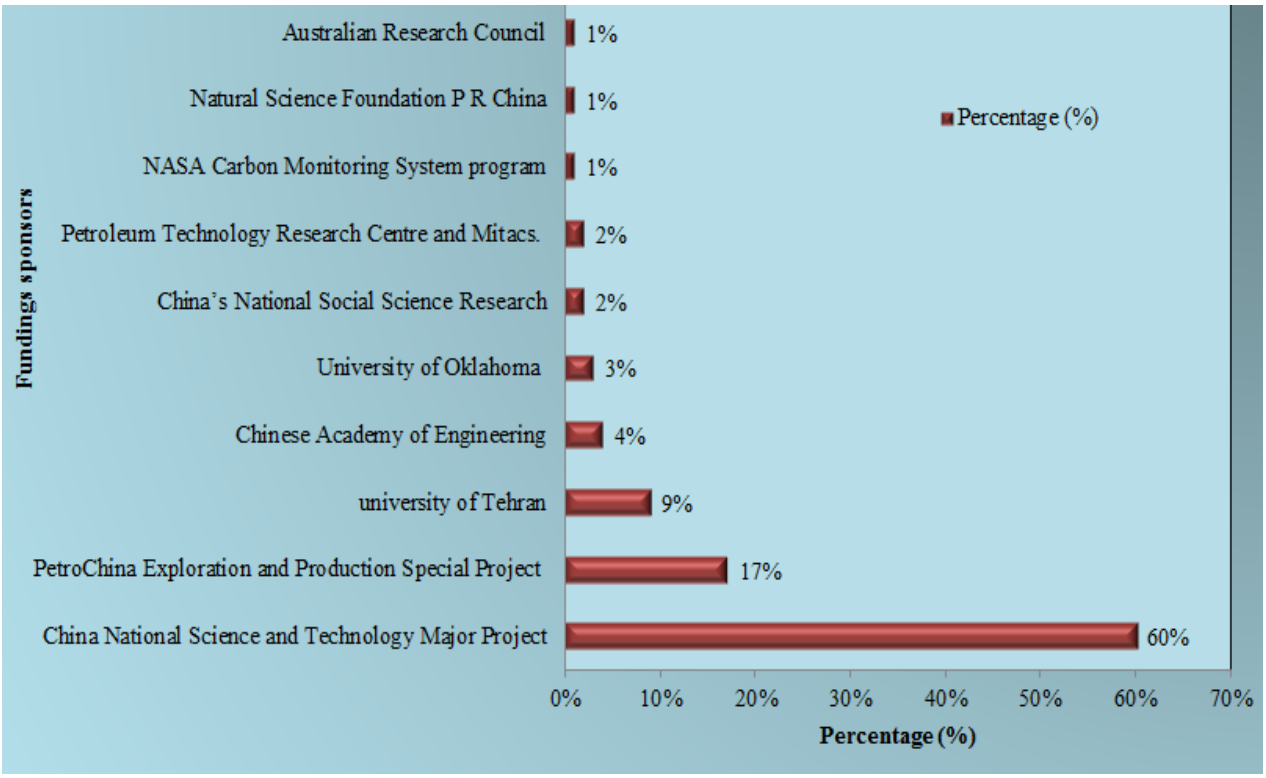

Figure 12: Employing ESG and sustainable practices in the oil and gas business through statistical analysis based on funding sponsors

From Figure 12, it was found that the majority and a surprising funding percentage are sponsored by the "China National Science and Technology Major Project" with 60 %. The 2nd highest funding had been done by the sponsor's name "PetroChina Exploration and Production Special Project". The lesser funding is sponsored by the 3 sponsors, namely the NASA Carbon Monitoring System program, Natural Science Foundation P R China, and the Australian Research Council.

4. Benefits and drawbacks of empowering Indian investors in the oil and gas sectors using ESG and sustainable practices

Benefits

Using ESG and sustainable practices to empower Indian investors in the oil and gas sector can have several benefits. In addition to standard financial measures, ESG investment takes a company's environmental, social, and governance performance into account [71]. By including ESG considerations in their investment decisions, investors hope to generate long-term value. Subsequently, the sponsoring businesses can contribute positively to governance practices, the environment, and society [72]. Some advantages of utilizing ESG and sustainable practices to empower Indian investors in the mentioned sector are as follows:

- **Improved environmental performance**: Companies that implement sustainable measures to lessen their environmental effect may find encouragement from ESG investing. This may also result in less water being used, less garbage being produced, and a reduction in greenhouse gas emissions [73].

- **Enhanced social responsibility**: By pushing businesses to implement ethical labor practices, uphold human rights, and give back to the communities in which they operate, ESG investing may advance social responsibility.
- **Better corporate governance**: ESG investing can optimize corporate governance by encouraging companies to adopt transparent and ethical business practices. Further, this can lead to better risk management, improved decision-making, and increased accountability [74].
- **Attracting responsible investors**: Companies that adopt ESG practices are more likely to attract responsible investors and people to invest in sustainable and ethical businesses. This can lead to increased capital inflows and improved access to financing.
- **Competitive advantage**: By setting themselves apart from their competitors, businesses that use ESG principles might obtain a competitive edge. This may result in a larger market share, better consumer loyalty, and an enhanced reputation for the brand [75].

Drawbacks

While empowering Indian investors in the oil and gas sectors using ESG and sustainable practices can have several benefits, there are also some drawbacks to consider. Here are some of them:

- **Restricted investment opportunities**: Since this industry requires a large amount of capital, not all businesses may be able to satisfy ESG standards. This may reduce the prospects for Indian investors to make investments in the industry [76].
- **Higher costs**: Companies that adopt ESG practices may incur higher costs in the short term, which can impact their profitability and returns. This can lead to lower returns for investors in the short term [77].
- **Lack of standardization**: There is currently no standardized framework for measuring ESG performance, which can make it complex for investors to compare companies and make informed investment decisions [78].
- **Restricted data availability**: ESG investing relies on non-financial metrics, which may not be readily available for all companies. This can make it complex for investors to calculate the ESG performance of companies [79].
- **Regulatory risks**: Numerous regulatory risks, such as shifts in governmental policy, environmental restrictions, and geopolitical risks, can affect the said industry. The profitability and profits of businesses in the industry may be impacted by these risks [80].

5. SUMMARY

Sifting through enormous volumes of historical and current data to estimate future trends, performance, and risks in the industry is a key component of ESG and sustainable practices. This approach can reduce any disruptions to the oil and gas chain, improve decision-making, and optimize operations. Five research questions—designated as RQ1, RQ2, RQ3, RQ4, and RQ5—are addressed in this study:

- **Keywords utilized for locating the document (RQ1):** This answer has been explained in section 3.1 by mentioning the keywords utilized.
- **Journals taken into consideration for the Bibliometric analysis (RQ2):** Totally, 25 journals were taken for the bibliometric analysis, and it is explained in section 3.2.
- **Papers taken from the journals (RQ3):** The number of papers count had been explained in section 3.4 based on 3 different categories, namely 2013 to 2016, 2017 to 2019, and 2020 to 2023.
- **Top 25 authors with higher citations (RQ4):** The top 25 authors had been mentioned in section 3.10 with their journal's name and citation number.

- **Benefits for Indian investors in the oil and gas sectors using ESG (RQ5):** Benefits along with drawbacks have been explained deeply in section 4.

6. INFERENCES AND LIMITATIONS OF THE PRESENT STUDY

The field of research on utilizing ESG and sustainable practices to empower Indian investors in oil and gas is becoming more global in scope. The importance and contributions of the writers, their nation, funding organization, affiliations, etc., have been highlighted in this review. Most of the studies included in the article are from journals that address the subject of utilizing ESG and sustainable practices to empower Indian investors in the oil and gas industry. Many of the papers included in this review were written in English by the researchers. In all, 621 works from 2013 to 2022 are included in this paper for bibliometric review analysis.

For analyzing how ESG and sustainable practices research might empower Indian investors in the oil and gas industry, a variety of research sources are available. However, the publications in this bibliometric review report can only be accessed through the Scopus database. For the purposes of this study, Google Scholar and other significant data research sources are not used. The keywords used to query the Scopus database were chosen by the authors. The keyword combination for the study will be rearranged or updated based on the researcher's perspective.

7. CONCLUSION

Numerous study topics have been published that focus on enabling Indian investors in the oil and gas sector using ESG and sustainable practices. In addition, a great deal of material has been reviewed on relevant topics. Using ESG and sustainable practices from the Scopus database, this article conducts a bibliographic survey on the topic of empowering Indian investors in the oil and gas sector. Even with so many alternative databases available to the public, it is still indisputable that the Scopus database is the most extensively used and well-liked database for tracking, comparing, and exploring multiple citations. Initially, a total of twenty-five journals were screened and taken into consideration for the study on how ESG and sustainable practices might empower Indian investors in the oil and gas industry. Journal metrics that are studied from the database include SJR, SNIP, publishing frequency, publisher, and impact factor. The author's home country as well as the publications they made under various journal titles for the study were examined. This paper's bibliometric study made it simpler to pinpoint their evolution and patterns. A viable direction for future research would be to focus on each of the process's domains in this bibliographic evaluation.

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