

A Study of Renewable Energy and Hydroelectric Literature through Bibliometric Positioning during Four Decades

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A Study of Renewable Energy and Hydroelectric Literature through Bibliometric Positioning during Four Decades

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Abstract:

Background: Renewable energy as a solution to supply future and current needs. This paper aims to review the status and visual map position of research in the internationally renewable energy and hydroelectric literature indexed Scopus that used a bibliometric positioning overview. The research was carried out using bibliometric techniques. Data analysis as well as visualization utilising VOSViewer program and the Scopus function for analyze search results. In this review, the details collected applied to 1,895 documents issued from 1978 through 2020. The study reveal that Karadeniz Teknik Üniversitesi and United States Studies were the most active affiliated institutions scientists and nation in renewable energy and hydroelectric literature. In Renewable energy and hydroelectric literature, the Energy and Renewable And Sustainable Energy Reviews were the most areas of study and dissemination sources. There were eight worldwide group maps with collaborative researchers. In order to identify the body of knowledge created from thirty two years of publication, this study constructed a convergence axis grouping comprising of renewable energy and hydroelectric literature: Power, Hydroelectric, Ecology, Nation, Economic, Wind, and Energy, abbreviated as PHENEWE themes.

Key Word: Renewable Energy; Engineering, and hydroelectric

I. Introduction

The exploitation of Renewable Energy (RE) sources has gained immense recent interest for several years [1]. Renewable energy includes energy that comes from natural processes that do not involve the consumption of inexhaustible resources such as fossil fuels and uranium [2]. Renewable energy [3] is a very important innovation, fast and safe [4] [5], renewable energy sources bring many benefits [6] and advantages [7], renewable energy as a solution to supply future and current needs [8], to provide technological power [9] and improve global energy efficiency, and decrease the need for media transmission [10]. Some countries have initiated a shift towards renewable resources based on geographic location and local resources [11].

The world energy consumption rate is rapidly growing, coupled with the associated environmental impact of such energy consumption, which is based on various communities and among researchers, engineers, and even politics [12]. Namely to determine the war strategy [13], such as power quality [14] which is furthermore to match the increasing power requirements [15]. Renewable energy systems and integrated renewables systems are used to make use of available renewable sources [16]. Renewable energy sources play an important role in the generation of electrical energy [17], because they serve to overcome dependence on non-renewable resources [18]. Hybrid systems increase the load factor and provide maintenance and replacement costs, because the components of renewable resources are complementary [1]. For the optimal combination of various renewable energies, various types of hybrid systems and techno-economic analysis methods are used [19].

In principle, hydrogen would be the best solution to the energy crisis (vide infra) and the idea of relying on this element for an inexhaustible source of energy [20]. And aims to assist in the development and use of renewable energy [21]. Hydroelectric is an alternative energy source [22]. Hydroelectric power has many positive characteristics. Apart from power generation and efficiency, it has advantages such as: flood protection, flow regulation, dual use, fossil fuel avoidance, long depreciation period, income with adequate electricity levels, and low operating-maintenance-replacement costs [22]. In a hybridelectric system, a water turbine converts the water pressure into mechanical shaft power, which could be used to drive an electric generator, or other machines. The available power is proportional to the product head pressure and volume flow rate [23]. The pumped hydroelectric energy storage stores energy in the form of potential energy of water pumped from the lower reservoir to the higher reservoir. In this type of system, low cost electric power (electricity at off-peak times) is used to run the pump to raise water from the lower reservoir to the upper reservoir.

During periods of high power demand, stored water is released through hydro turbines to generate electric power. A reversible turbine / generator assembly serves as a pump or turbine, if needed. A pumped-hydroelectric-storage (PHES) conceptual system with wind and solar power options to transfer water from the lower reservoir to the top [24] Renewable energy sources are environmentally friendly [25], one of which is by increasing power

generation by using distributed charging stations based on renewable energy sources [26]. With increasing public awareness of environmental protection and strengthening continued government support, more and more home users have installed small scale distributed renewable energy power generation systems such as solar power and wind energy [27] [28]. Therefore, it is highly expected that future markets will see high growth of these technologies with different types of distributed generation [29]. Renewable and alternative energy has great potential benefits to replace dependence on fossil fuels, progress bringing it into the mainstream slowly in most developing countries [30].

In a study conducted by Zifa Liua, Zhe Zhang, Ranqun Zhuo, Xuyang Wang demonstrated the advantages of the proposed optimal strategy over the optimal no-operation strategy in ensuring reservoir water levels, increasing the efficiency of hydropower plants, and avoiding the risk of not running water for generating electricity in hydroelectric power in the end [31]. In general, previous research related to Renewable energy and hydroelectric has only examined one research topic, such as one country [1], and one field [21]. Unfortunately, although it displays a broad image map visualized from year to year with details from several published studies on a global scale, there is not much literature on renewable energy and hydroelectric. The strong positive relationship regarding affiliation, scholars, and the impact of scientific studies has also not been explicitly discussed by any publication. This study aims to study the position of literature in the field of renewable energy and hydroelectricity by researchers at the global level published internationally indexed by Scopus using bibliometric position. We are monitoring an increasing number of scientific documents related to renewable energy and hydroelectric published and indexed by Scopus from 1978 to 2020.

II. Methods

This review maps the status of studies carried out in the last 42 years at a global level based on "Renewable Energy and Hydroelectric". In January 2021, this study collected data from Scopus using a document search query. The study was conducted using bibliometric techniques. Data analysis and visualization using VOSViewer program and Scopus function to analyze search results [32][33].

This study identifies renewable energy and hydroelectric keywords to recognize and look for Scopus database publications with 1,895 globally published documents from 1978 through 2020. The research confined collection of data to 2020 and excluding 2021. In order to reflect the state of the study over the entire year, the annual academic data collected from January to December. (TITLE-ABS-KEY ("renewable energy") AND TITLE-ABS-KEY ("hydroelectric")) AND PUBYEAR < 2021 AND (LIMIT-TO (SUBJAREA , "ENER")) is the query input command which is implemented while mining academic publication data on online database of Scopus.

The research applies a co-authorship analysis with authors' analysis units and full calculation systematic techniques utilizing VOSViewer to gain the collaboration research network of the international researcher. The research conducted an in-depth co-occurrence analysis with keyword relation analysis as well as a full systematic technique of calculation utilizing VOSViewer to generate a keyword map network.

III. Result and Discussion

Renewable energy and hydroelectric literature appear to be likely to increase and grow per year. The tallest point for international publication was 205 documents in 2020. Since 1978, publishing on Renewable energy and hydroelectric has already started.

3.1 Renewable Energy and Hydroelectric Literature Most Common Organizational Affiliations

The leading research organizations in Renewable energy and hydroelectric literature was Karadeniz Teknik Üniversitesi with 19 papers, pursued by University of Zagreb with 18 papers, Universidade Federal do Rio de Janeiro with 17 papers, Norges teknisk-naturvitenskapelige universitet with 17 papers, National Technical University of Athens with 16 papers, Haskoli Islands with 16 papers, Universidade de Lisboa with 16 papers, Tsinghua University with 15 papers, European Commission Joint Research Centre with 15 papers, and Instituto Superior Técnico with 13 papers..

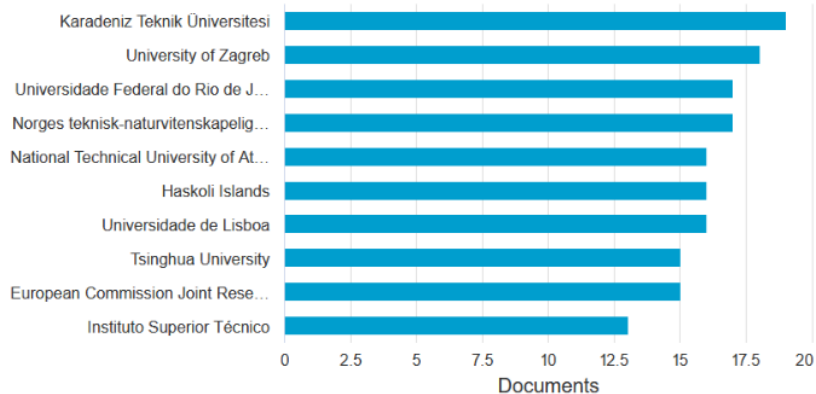


Figure 1. Organizational Affiliation Number of Annual Publication of Renewable Energy and Hydroelectric Literature

3.2 Renewable Energy and Hydroelectric Literature Most Individual Researcher

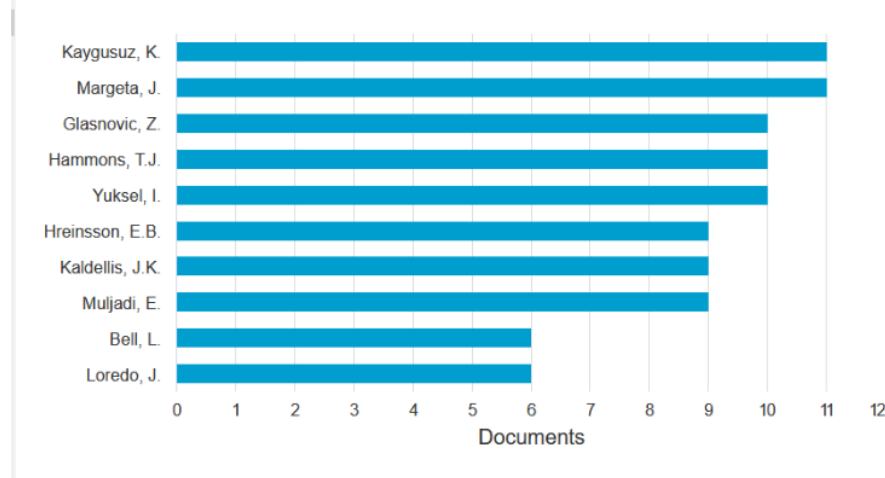


Figure 2. Most individual Renewable Energy and Hydroelectric Literature Researcher

The researcher in the area of Renewable energy and hydroelectric to the most writings was Kaygusuz, K. with 11 papers, Margeta, J. with 11 papers, Glasnovic, Z. with 10 papers, Hammons, T.J. with 10 papers, Yuksel, I. with 10 papers, Hreinsson, E.B. with 9 papers, Kaldellis, J.K. with 9 papers, Muljadi, E. with 9 papers, Bell, L. with 6 papers, and Loredo, J. with 6 papers

3.3 Nation Number Of Annual Publication Of Renewable Energy and Hydroelectric Literature

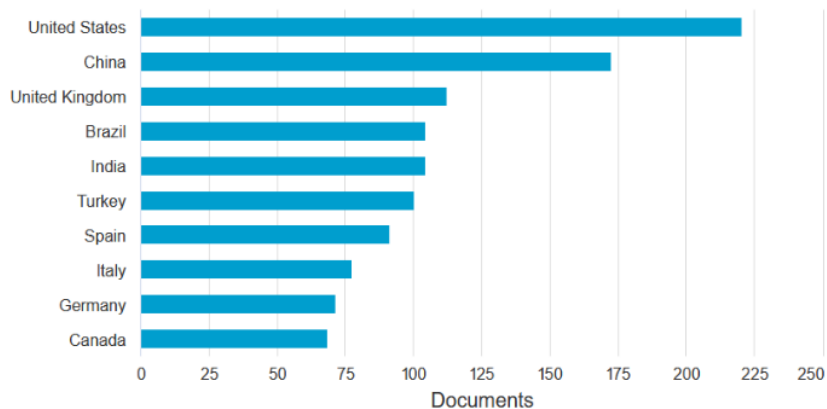


Figure 3. Number of Documents by Nation from the Renewable Energy and Hydroelectric Literature

In Renewable energy and hydroelectric literature publications, the United States with 220 academic documents was the leading research nation, followed by China with 172 papers, United Kingdom with 112 papers, Brazil with 104 papers, India with 104 papers, Turkey with 100 papers, Spain with 91 papers, Italy with 77 papers, Germany with 71 papers, and Canada with 68 papers.

3.4 The Largest Frequency of Publication of Renewable Energy and Hydroelectric Literature by Subject Area

With 1,895 documents (49.5% percent), Energy in the subject area was the most frequent subject areas in international research on Renewable energy and hydroelectric Literature. Pursued by Engineering, (19.0%) with 726 papers; Environmental Science (11.3%) with 433 papers; Mathematics (4.0%) with 152 papers; Earth and Planetary Sciences (2.8%) with 109 papers; Computer Science (2.5%) with 96 papers; Social Sciences (2.1%) with 79 papers; Economics, Econometrics and Finance (2.0%) with 77 papers; Business, Management and Accounting (2.0%) with 76 papers; and Chemical Engineering (1.0%) with 73 papers.

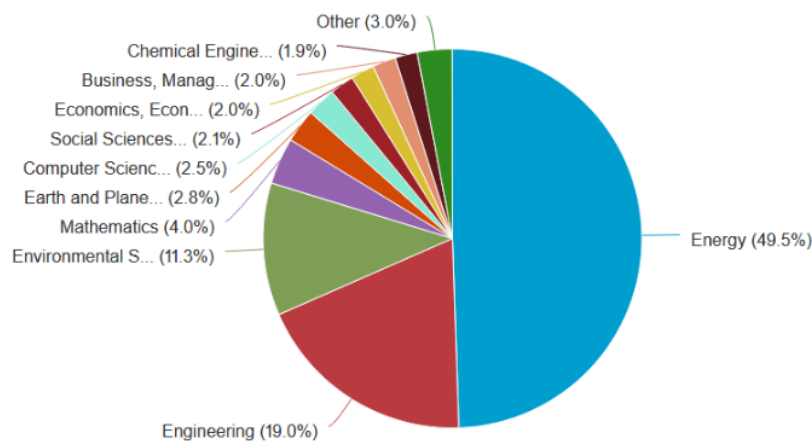


Figure 4. The Largest Frequency of Publication of Renewable Energy and Hydroelectric by Subject Area

3.5 Year Documents of Renewable Energy and Hydroelectric Literature Publication Sources

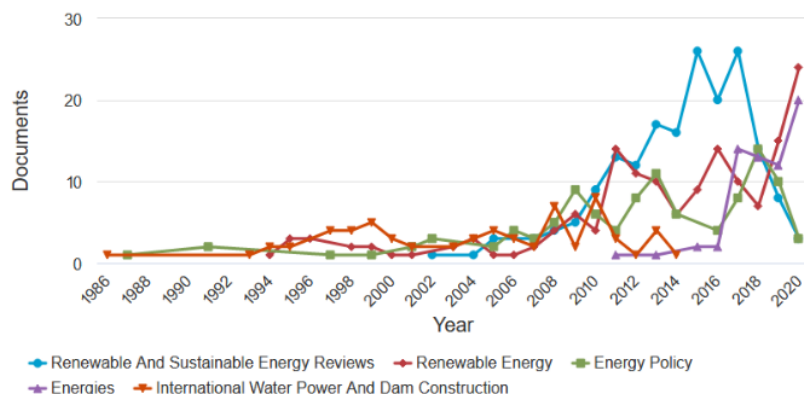


Figure 5. Year Annual Documents of Renewable Energy and Hydroelectric Literature Publication Sources

The leader in the annual number of sources of Renewable energy and hydroelectric Literature publications is the Renewable And Sustainable Energy Reviews with 181 document, Renewable Energy with 156 document, Energy Policy with 107 document, Energies with 65 document, International Water Power And Dam Construction with 64 document.

3.6 Annual documents from the Renewable Energy and Hydroelectric Literature

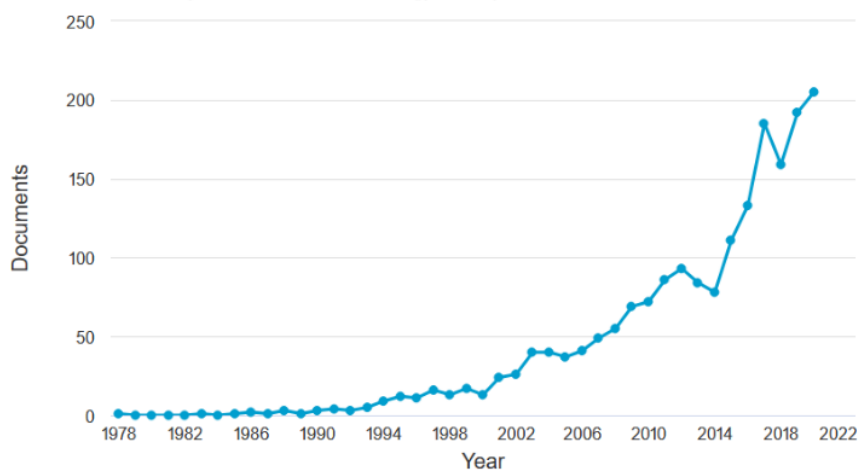


Figure 6. Annual Number of Documents Per Year from the Renewable Energy and Hydroelectric Literature

The annual number of international publications from Renewable energy and hydroelectric literature has shown an increasing trend every year. The annual number of documents per year in Renewable energy and hydroelectric publications is that in 2020 there were 205 papers, and in 2019 there were 192 papers

3.7 The Renewable Energy and Hydroelectric Literature Article Cited

The study by Paish, O. is the most cited publication on Renewable energy and Hydroelectric literature. the most cited number in 2002 was entitled "Small hydro power: Technology and current status", citing 548 documents [23].

3.8 Map of Study Themes

With analysis and visualization of the VOSViewer program, construction was developed on the
 DOI: [10.26737/adri27](https://doi.org/10.26737/adri27)

3. Blue cluster: Liu, Y., Yang, W., Yang, J., and Li, Y.
4. Yellow cluster: Chen, I., Wang, X., Wang, H., and Liu, Z..
5. Purple cluster: Wang, Y., Zhang, H., Wang, I., and Zhang, Y.

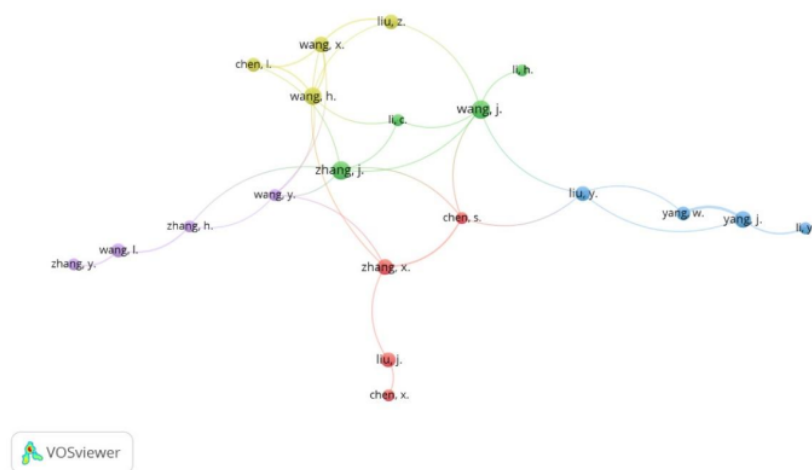


Figure 8. Authorship Network Map

IV. Conclusion

The results of this research revealed that there is an annual trend towards a spike in the amount of international publications on "Renewable Energy and Hydroelectric", there were maps and visual patterns. The leading research organizations in Renewable energy and hydroelectric literature was Karadeniz Teknik Üniversitesi with 19 papers. Meanwhile, The researcher in the area of Renewable energy and hydroelectric to the most writings was Kaygusuz, K. with 11 papers.

In Renewable energy and hydroelectric literature publications, the United States with 220 academic documents was the leading research nation. With 1,895 documents (49.5% percent), Energy in the subject area was the most frequent subject areas in international research on Renewable energy and hydroelectric Literature. The leader in the annual number of sources of Renewable energy and hydroelectric Literature publications is the Renewable And Sustainable Energy Reviews with 181 document. With 205 papers, the highest publication of worldwide scholarly publications in renewable energy and hydroelectric literature was in 2020. The study by Paish, O. is the most cited publication on Renewable energy and Hydroelectric literature. the most cited number in 2002 was entitled "Small hydro power: Technology and current status", citing 548 documents. There were five researcher partnership groups linked to the publication of renewable energy and hydroelectric literature.

In terms of contributing knowledge implications, this study recommends a classification of the convergence axis comprising of publication in renewable energy and hydroelectric literature to classify the body of knowledge created from thirty-six years of academic publication: Power, Hydroelectric, Ecology, Nation, Economic, Wind, and Energy, abbreviated as PHENEWE themes. The identification of key themes in the renewable energy and hydroelectric leads, as practical implication, contributes to an awareness of the creation of practical studies to clarify general contexts and topics, as well as research gaps. All this will lead to fresh research addressing a lack of study and specialized expertise in the disciplines. The most studied themes often reflect the ability to contribute of renewable energy and hydroelectric to engineering, environmental, technology, and management.

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