

# From The Past to the Future, Research on Biomass Energy and the Environment

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**ABSTRACT:** *The development and use of biomass energy may aid in the transformation of energy production and consumption, as well as the establishment of a sustainable energy system that can successfully support national economic growth while also strengthening environmental protection. We conducted a bibliometric analysis of 9514 literature reports from 1998 to 2017 that were found using the key words "Biomass energy" and "Environment\*" in the Web of Science Core Collection; hot topics in biomass energy utilization research and development, as well as the status and development trends of biomass energy utilization and the environment, were analyzed using content analysis. As the study progressed, the connection between biomass energy and the environment started to become a significant issue. This study is critical for the development and use of biomass energy, since it offers precise recommendations and methods based on the investigation and illustration of connections and interactions between biomass energy use and the environment. It is also beneficial to researchers in terms of choosing future study subjects.*

**KEYWORDS:** *Bibliometrics, Biomass Energy, Development, Environment, Economic Growth.*

## 1. INTRODUCTION

With the advancement of civilization and the expansion of the economy, resource and environmental issues become more essential, posing the two most significant challenges to global growth. The development of new energy and renewable energy has been regarded as the focus of a new trend of industry promotion and development. All countries around the world are looking for new types of energy that are sustainable and clean and can replace conventional fossil fuels, and the development of new energy and renewable energy has been regarded as the focus of a new trend of industry promotion and development. Biomass energy is a renewable resource that can be converted into three stages of fuel: gas, liquid, and solid [1].

Together with other emerging energy sources such as wind, solar, and nuclear energy, biomass energy becomes a new alternative energy source. All nations in the globe are concerned about the effective development and clean use of biomass resources. Biomass energy plays a significant role in the energy system as one of the most important renewable energy sources. Biomass energy development and utilization can help to shift energy production and consumption patterns) and establish a sustainable energy system that can effectively promote national economic development while also strengthening environmental protection. It is critical to bring forth specific recommendations and plans based on the study and demonstration of the connection and interaction between biomass energy usage and the environment for the development and use of biomass energy [2].

By studying the distribution, scalar relationship, and change regulation of literature and information, bibliometrics, a very effective method of summarizing and analyzing, can be used to explore the structure, characteristics, and laws of subject. The hot areas and trends in scientific study on environmental direction and biomass energy use during the past 20 years may be summarized using this approach. There's no denying that the findings of comparative and synthetic research on content analysis and bibliometrics have obvious theoretical implications for the development of biomass energy consumption [3].

A bibliometric study of 9514 articles reported in the Web of Science Core Collection dated from 1998 to 2017 and searched with the keywords "Biomass energy" and "Environment\*" was carried out up to February 1, 2018. Content analysis and bibliometrics were used to examine hot themes in biomass energy utilization research and development, as well as the status and development trend of biomass energy utilization and the environment. Bibliometrics is a statistical technique for assessing and quantifying a subject's quantity and growth trend. The measuring features and the literature system take into account the item examined using a metering technique,

such as a mathematical or statistical method. Through quantitative examination of the quantity structure and change control of literature information, the research progress of a specific area may be examined and evaluated systematically.

Eugene Garfield developed the impact factor (IF) in 1972, and it is the most often used assessment measure of a journal's importance. The average number of quotations mentioned in the preceding year by articles published in the first two years of a publication is reflected in IF. The quality of the articles published in a journal has a significant connection. As a result, IF is considered as a significant indicator for evaluating academics and the impact of a work [4].

The American Institute of Science and Technology Information (ISI), which is published by the Journal of Science and Technology, issues the authoritative and accurate IF report in academic areas. The IF released by JCR in 2014 is used in this study. Hirsch introduced the H-index in 2005 as another metric for assessing a journal's impact. The Hindex is a measure of how many times h papers from a country/region, a magazine, an organization, etc. have been cited at least h times during a certain period of time. The H-index has the benefit of combining the number of published articles and their impact into a single measure [5].

## 2. DISCUSSION:

Between 1998 and 2004, the number of periodical articles published fluctuated by about 80. The overall number of writers and references has remained relatively constant throughout time. Since 2004, the total number of publications, authors, and references in biomass energy environment study has grown considerably. It is clear that research in this area has accelerated in the last 20 years, and internal collaboration and interchange have become more active. The shifting trend in the number of articles can also be seen in the red line. Before 2004, the growth rate of periodical articles varied significantly. After 2006, the growth rate leveled off, and the yearly number of periodical articles started to rise gradually [6].

### *Contribution analysis at the national and regional levels*

By examining the postal addresses of periodical articles, the contribution of various countries/territories and institutions was investigated. In the area of biomass energy and environment, the United States published the most papers with 1456. At the same time, it was rated second in terms of international collaboration. With a Hindex of up to 80, the United States is also top in terms of depth and impact. China came in second place, based on the total number of articles and the H-index. North America and the Nordic area are also doing well. Brazil, India, and Australia also performed well in the fields of biomass energy and environmental protection. The number of periodical articles produced by the top five nations remained relatively constant until 2004. Around 2005, the yearly number of periodical articles started to rise noticeably. It demonstrates how quickly research in the fields of biomass energy and the environment has progressed since 2005. The United States' growth advantage is more apparent [7].

The link between them represents the constructive cooperation between various nations. The tighter the collaboration is, the thicker and deeper the line is. The importance of the United States and China in this area, as well as the close collaboration between China and the United States. Furthermore, the US has increased collaboration with the United Kingdom, Italy, and Brazil. China has extensive collaboration with the United Kingdom, Germany, and India. Between the producing regions, there is already a broad variety of collaboration and connections. There is still room for further growth of exchanges and collaboration in this area. For example, in the past 20 years, the United States and China, two of the world's most powerful nations, have had no exchanges or collaboration with countries like Finland and Greece [8].

### *Contribution analysis of institutes*

Germany, France, Brazil, and the Netherlands are the top four countries in the world. The Chinese Academy of Sciences published the most papers (128), greatly outnumbering all other organizations. The number of papers published by other agencies does not vary much. Despite the fact that the United States had published the most papers, American institutions did not come out on top of the list. The Chinese Academy of Science has the most monthly publications among the institutes from 1998 to 2017. It is also the first university to join the area of

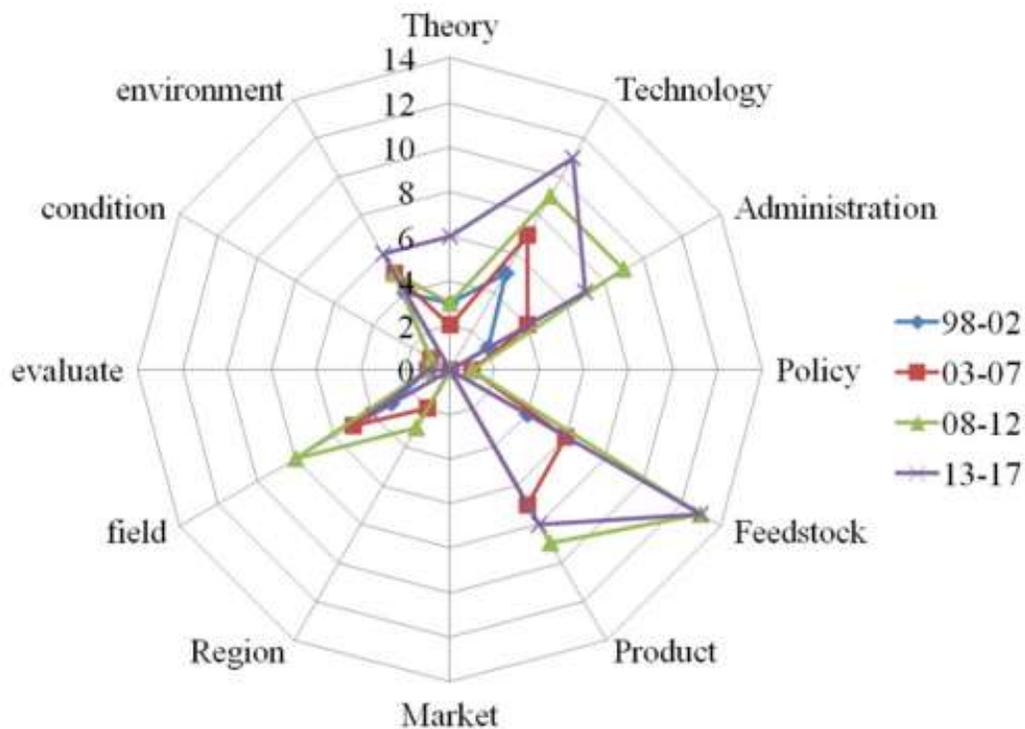
biomass and the environment, having begun relevant research in 2000, far before the other universities. With an H-index of 22, the Chinese Academy of Science was also top in terms of depth and impact. The number of papers produced by the top five universities has been fluctuating at an increasing rate [9].

Furthermore, in the areas of Engineering and Agriculture, there were 1561 and 1112 publications, respectively, indicating that application-based research is quickly growing alongside theoretical research. From 1998 to 2004, the number of periodical articles published in the disciplines of Energy & Fuels, Environmental Sciences & Ecology, Engineering, Agriculture, and Biotechnology & Applied Microbiology was consistent with the trend in the number of articles published. Since 2004, the number of papers published in these five topics has risen substantially. Environmental Sciences & Ecology and Engineering, on the other hand, had a consistent rise in the number of papers published after 2011, compared to Energy & Fuels. The number of papers published in the fields of agriculture, biotechnology, and applied microbiology has clearly decreased.

From 1998 to 2017, the major fields of biomass energy and the environment research were Energy & Fuels, Environmental Sciences & Ecology, and Engineering. This indicates that, after a period of largely unitary technology application study, the focus shifted to more broad research on the environment and engineering. Agricultural and forestry waste as a primary raw material has a greater technical cost, and there are less marketed initiatives. Microalgae research as a biofuels raw material is mostly in the laboratory stage. As a result, reducing technical costs, increasing production, and conducting engineering application research are all key directions for the development of biomass energy technology [10].

One of the goals of biomass energy development is to enhance the environment. The reutilization of biomass energy engineering wastes not only has an impact on the ongoing operation of biomass projects, but it also generates severe secondary pollution. Another issue with biomass energy engineering is the high cost of recycling and transportation. In order to examine and solve these issues in a more complete and thorough manner, life cycle assessment became more essential. Interactions and collaboration across nations and regions may help accelerate and broaden the development of biomass. There is still a lot of room for countries to communicate with one another.

Combining feedstock, product market, advantage technology, and advanced management experience can help achieve a more balanced development of the environment and economy. The study of the peculiarities of various areas in the field of biomass is beneficial to the worldwide community's complementing collaboration. The reutilization of biomass energy engineering wastes not only has an impact on the ongoing operation of biomass projects, but it also generates severe secondary pollution. Another issue is that the cost of recycling and transporting biomass energy engineering is extremely high. Figure 1 discloses the Radar Map of the Keywords Category Changing Tendency during 1998–2017



**Figure: 1 Radar Map of the Keywords Category Changing Tendency during 1998–2017.**

### 3. CONCLUSION:

The features of biomass, energy, and environment-related papers published between 1998 and 2017 are examined using bibliometrics and the Web of Science Core Collection database. Over time, research on biomass energy and the environment has become more comprehensive and worldwide, as shown by this study. The last two decades Studies on similar topics have also been going on.

Further and deeper into these topics the most widely spoken language in the world. 98.06 percent of the articles was written in English. The Chinese Academy of Science, on the other hand, had the most members.

The highest H-index and the greatest number of periodicals among all the establishments It is also the first institution to have a library. Began looking into the subject. The United States and China are both involved in the game. Most significant responsibilities in this sector, but collaboration between them is also vital. China and the United States have a strong relationship. However, there is still room for improvement. According to the subject analysis, the study progressively started to shift away from early, largely unitary technological application research and toward more complete environmental and engineering research. Efficiency and optimization of energy use become an issue. Other issues have arisen as a result of the advancement technological research.

Have progressively piqued the public's interest the development of biomass Fuel technology has progressed, as has industrialization. Higher demands for a varied biomass material source have been suggested. Biomass energy and the environment are inextricably linked. As the study has progressed, it has become a significant issue. Furthermore, we have thoroughly examined the interconnection network as well as the development of keywords, as well as research discrepancies. among the world's most producing nations, as well as biomass and related research issues environment. Non-food biofuel development is still a hot topic in the industry. raw materials is a term used to describe a field in which raw materials are used.

It is an essential path for technological progress in order to lower the cost of technology, enhance manufacturing, and conduct engineering application research. Theca and other assessment techniques will be introduced, which will help. The growth of biomass energy in a healthy way and the enhancement of biomass energy the natural

environment the international community's complementing collaboration can help to speed up and broaden the process.

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