

ENERGY EFFICIENCY GAP: META-ANALYSIS

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ABSTRACT. The article is devoted to meta-analysis of scientific publications on the problem of the energy efficiency gap in order to identify scientific trends in research. The authors tested the hypothesis as follows: increased publication activity on the analysis of the energy efficiency gap; mainly the energy efficiency gap is analyzed from a technical point of view; an increase in the number of articles devoted to the analysis of the energy efficiency gap and sustainable development. The authors analyzed 105,357 articles from the Web of Science and Scopus. The results showed that the three clusters were joined by two intermediate clusters: renewable energy and waste Management. The results of the meta-analysis confirmed all the above hypotheses and allowed us to identify new research areas on linking the country's energy efficiency and sustainable development.

1. INTRODUCTION

Increasing issues of energy efficiency and energy dependence of countries provoke analysis and identification of the main parameters that affect its changes. The results of the analysis showed that for developing countries, the increase in energy efficiency was the result of a decline in industrial production in the country. In addition, developing countries have inefficient technologies that limit energy production. In addition, countries had imbalances in all sectors, which justified the allocation of financial resources to critical areas. In this case, the emerging economy does not have enough financial resources to develop renewable energy sources and green technologies. Scientists have confirmed that all of the above factors contribute to increasing the gap in energy efficiency in the country. Thus, it is necessary to analyze the main parameters and features of the energy efficiency gap. The results of the analysis of the approach to determining the energy gap showed that traditionally scientists explained this through the loss of energy in the power system. At the same time, the authors [2,3] proved that the energy gap is a difference in energy efficiency. In this case, energy efficiency becomes the key element.

2. METHODOLOGY

Scientists have confirmed that an effective energy policy has a statistically significant impact on sustainable development [4] and the country's macroeconomic stability. The results showed that scientists identify a massive range of parameters that affect energy efficiency and the energy efficiency gap. Thus, the main element that leads to a reduction in the energy efficiency gap is renewable energy, which contributes to additional green investments. Scientists have proven that green investments increase the energy efficiency of enterprises and lead to a reduction in the energy gap. In [2-4], the authors confirmed that renewable energy sources have a positive

impact on energy efficiency and lead to the elimination of the energy efficiency gap. The second parameter is innovative development. Thus, innovative services and technologies lead to increased energy efficiency. At the company level, energy efficiency depended on environmental management and implementation of corporate social responsibility. The effectiveness of financial policies, public administration and reforms had an impact on the country’s energy efficiency at the country level. The authors confirmed that the country’s environmental indicators [2], fiscal decentralization, investment policy, and legal support for energy innovations [4] also had a significant impact on the country’s energy efficiency. The results proved that scientists have identified a huge range of parameters that provoke changes in the energy efficiency gap. In addition, scientists have not adopted a universal approach to determining the energy efficiency gap. In this case, it is necessary to analyze the main scientific approaches to determining the energy efficiency gap.

3. RESULTS

The analysis of the Scopus and Web of Science tools allowed us to identify the General trend in publication activity, identify the main sponsors and subject areas. In addition, the analysis of Scopus and Web of Science tools allowed us to identify the most cited works and scientists who analyzed the energy efficiency gap. The last stage focused on visualizing co-occurrence and analyzing co-citation using the VOSviewer software. The results of the analysis of publication activity showed that scientists mainly analyzed the energy gap from an engineering point of view.

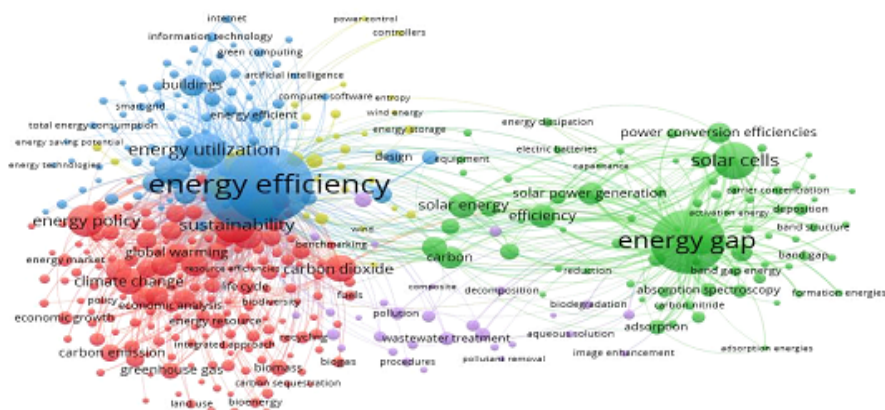


Table 1. Visualization of analysis of related events for 1991-2019 (Sources: compiled by the authors using VOSviewer).

Cluster	Number of items	Core keywords	links	Total link strength
Cluster 1 (red)	165	sustainability	315	10974.50
Cluster 2 (green)	105	energy gap	203	1380.00
Cluster 3 (blue)	79	energy efficiency	295	1899.00
Cluster 4 (yellow)	37	renewable energy	232	156.00
Cluster 5 (purple)	20	waste management	123	123.05

Thus, the results of the analysis by subject areas showed that 28% of the articles were published in the scientific journal in the physical and astronomical fields and 27% in the Material science subject areas. At the same time, it was revealed that the national natural science Foundation of China, the national science Foundation, the Department of science and technology, the Japanese society for the promotion of science, and Deutsche Forschungsgemeinschaft were significant sponsors of the energy efficiency gap study. In addition, such results can be confirmed

by the number of documents per country. 3,500 papers were selected for the next stage of the study. Visualization of the co-occurrence analysis (Table.1) allowed to identify 5 clusters of scientists with a stable background on the energy efficiency gap.

The obtained results proved that the energy gap is aimed at the development of solar energy and energy conservation. In addition, the large distance between clusters 1 and 2 meant a weak connection between them. Clusters 1, 3, 4 and 5 are located close to each other, which indicates a significant background of research in the field of energy efficiency, renewable energy and sustainable development. In this case, the results obtained suggested that the new research direction should focus on the analysis of the relationship between the energy gap, energy efficiency and sustainability.

4. CONCLUSION

The results of the meta-analysis confirmed all the above hypotheses and allowed us to identify new areas of research on linking the gap in energy efficiency and the country's energy efficiency. Thus, the results obtained confirmed an increase in publication activity on the analysis of the energy efficiency gap. At the same time, the energy efficiency gap was mainly analyzed from a technical point of view, which is confirmed by joint citations and coincidence analysis. Visualization of the results of the meta-analysis led to the conclusion that there is not much research on the relationship between the energy efficiency gap and sustainability. On the other hand, an analysis of recent published papers has shown that scientists have begun to study the energy efficiency gap within the framework of the concept of sustainable development.

Keywords: Green Economy, Green Investment, Energy Efficiency, Energy Gap, Sustainable Development.

AMS Subject Classification: 68U01.

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