

Analysis and evaluation of Worldwide Carbon emission topics in economic journals: a review on articles published during 2016-2021

Nurbek Khalimjonov, Piratdin Allayarov, and Kizlargul Tajibaeva

Tashkent State University of Economics, 100066 Tashkent, Uzbekistan

Abstract. Carbon dioxide is the most prevalent gas, prompting researchers to investigate carbon reduction and mitigation measures. Carbon emission reporting is just one aspect of this domain's research, which also includes identifying and implementing carbon mitigation and reduction measures. However, there isn't a thorough study accessible to track global research on carbon emissions. As a result, this study examined the global literature on carbon emissions using a scientometric analytic method. From 2016 to 2021, 167 bibliographic records were taken from the Scopus collection database and evaluated utilizing author, journal, country, and keyword analysis approaches. China, Turkey, the United States, and the United Kingdom made the most substantial contributions to the domain. The findings revealed that over the study period, the publication of papers relating to carbon emissions increased, and China produced a greater number of publications and authors (45.12 percent of total). Furthermore, this page examines the most commonly used input keywords. The major findings of this study will be useful for politicians, researchers, and institutions in determining future research directions and identifying whom they might consult to assist in formulating carbon emission control policies and future carbon reduction objectives, according to the authors.

1 Introduction

Every month, carbon dioxide, a critical greenhouse gas that contributes to global climate change, rises (Huang et al, 2010; Twusami et al, 2017). By trapping heat from the sun, greenhouse gases have kept Earth's temperature tolerable for humans and millions of other species. However, those gases have become out of balance, threatening to significantly alter which living creatures can live on this planet—and where they can survive (Rokhmawati et al, 2017).

Carbon dioxide, the most dangerous and prevalent greenhouse gas, is at all-time highs in the atmosphere (Abolhossei et al, 2014). The main cause of the high levels of greenhouse gases in the atmosphere is that they were released into the atmosphere by humans burning fossil fuels. The gases absorb heat rather than allowing it to escape into space, keeping it close to the Earth's surface. The greenhouse effect is the outcome of this heat trapping (Boyd et al, 1988). In 1896, Swedish physicist Svante Arrhenius was the first to link an increase in carbon dioxide gas from burning fossil fuels with a warming effect. (Alshehry et al, 2015). "The greenhouse effect has been established and is currently influencing our climate,"

American climate scientist James E. Hansen testified to Congress nearly a century later (Pao et al, 2012). Climate change is the term scientists use today to describe the complicated changes that growing greenhouse gas concentrations are having on our planet's weather and climate systems. Climate change encompasses not only rising average temperatures, sometimes known as global warming, but also extreme weather events, shifting species populations and habitats, rising sea levels, and a number of other effects (Obadi et al, 2015; Kraft et al, 1978).

The Intergovernmental Panel on Climate Change (IPCC), a United Nations panel that studies the latest climate change science, is monitoring greenhouse gases, tracking their effects, and adopting remedies all across the world (IPCC, 2014).

The most common greenhouse gas is carbon dioxide, which accounts for around three-quarters of all emissions (Balogh et al, 2017). It can last for thousands of years in the atmosphere. The highest monthly average of carbon dioxide ever measured at Hawaii's Mauna Loa Atmospheric Baseline Observatory was 411 parts per million in 2018. The majority of carbon dioxide emissions are produced by burning organic resources such as coal, oil, gas, wood, and solid waste (EPA, 2017).

Since 1900, global carbon dioxide emissions from fossil fuels have risen dramatically. CO₂ emissions have increased by roughly 90% since 1970, with fossil fuel burning and industrial activities accounting for about 78% of the entire increase in greenhouse gas emissions from 1970 to 2011 (Georgantopoulos et al, 2012; Odhiambo et al, 2010). The second-largest contributors were agriculture, deforestation, and other land-use changes (Mardani et al, 2018).

China, the United States, the European Union, India, the Russian Federation, and Japan were the world's top carbon dioxide (CO₂) emitters in 2014 (Tang, 2016). CO₂ emissions from fossil fuel combustion, cement production, and gas flaring are all included in these figures. These sources account for a significant fraction of total CO₂ emissions worldwide (Sasana, 2018).

In recent years, there have been initiatives to reduce the amount of carbon released in our daily lives. This never-ending quest has resulted in the development of technologies and methods such as reforestation, carbon capture, storage, and utilization, as well as a shift away from non-renewable energy sources like fossil fuels and toward renewable energy sources like solar, wind, biofuel, tides, waves, and geothermal heat. Biologically, chemically, and technologically, a low-carbon economy can be achieved by lowering or sequestering emissions (Saka et al, 2014).

Since decarbonization has become the cynosure of socioeconomic development, numerous countries and major agencies such as the European Union EU and the United Nations UN have enacted legislation to assist citizens in reducing emissions (Mardani et al, 2018).

2 Methodology

A total of 167 publications from the Scopus database were downloaded and evaluated between 2016 and 2021 using the phrase "carbon emission" to have a better knowledge of the research environment. The articles were arranged in chronological order by the year they were published. Then, for each of the papers that were analyzed, a database was established with information such the year of publication, author's name, citations, country, and journal name. We can look at the history of global carbon emissions thanks to the database's structure. The research was carried out during a single time period, from 2016 to 2021.

3 Results and discussion

3.1 Trends in the number of papers published throughout time

During 2016–2017, an average of 24 articles were included in the total 167 papers published on carbon emissions (Fig I), however in 2018 there was a little rise, reaching an annual number of 28 articles. The majority of publications published in 2020 (frequency = 45) were primarily about carbon emission assessment. In 2021, the lowest number of publications was recorded (13 articles only). Between 2016 and 2021, an average of 27 articles per year were published.

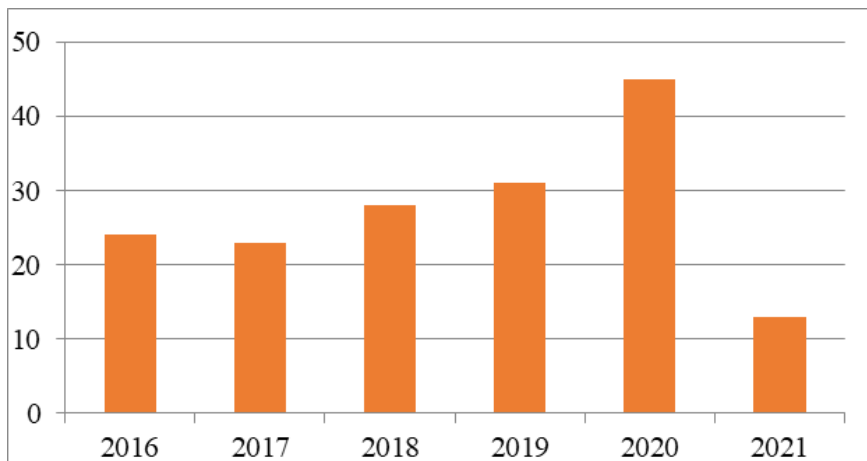


Fig. 1. The number of papers with carbon emissions sorted by publication year.

3.2 The trend of publishing journals

167 worldwide journals are mentioned in Scopus (Table I) from Economical articles reviewed over the period 2016-2021: Energy Economics, International journal of energy economics and policy, Structural Change and Economic Dynamics, "Environment, Development, and Sustainability," International Journal of Production Economics, and Ecological Economics had all published carbon emission indexed studies. Between 2005 and 2016, just six publications published 65.68 percent of all papers on carbon emission. The impact factor of the journals with the most articles was 1.98 on average.

Table 1. List of the journals on Carbon Emission in the World.

Scopus Source title	Number	Scopus Source title	Number
Energy Economics	39	China Agricultural Economic Review	1
International journal of Energy Economics and Policy	24	China: An International Journal	1
Structural Change and Economic Dynamics	12	Economic Change and Restructuring	1
Environment, Development and Sustainability	11	Economics of Energy and Environmental Policy	1

Continuation of Table 1.

Scopus Source title	Number	Scopus Source title	Number
International Journal of Production Economics	10	Empirical Economics	1
Ecological Economics	6	European Journal of Comparative Economics	1
Economic Modelling	4	Forum Scientiae Oeconomia	1
Applied Economics	4	International Journal of Business and Management Science	1
Economic Research-Ekonomska Istrazivanja	4	International Journal of Ecological Economics and Statistics	1
Energy Journal	4	International Journal of Political Economy	1
Pakistan Journal of Commerce and Social Science	4	International Journal of Social Economics	1
Resources Policy	4	Journal of Advanced Transportation	1
Economic Analysis and Policy	3	Journal of Business Economics and Management	1
China Economic Review	2	Journal of Energy and Development	1
Economic Systems Research	2	Journal of International Commerce, Economics and Policy	1
Environmental and Resource Economics	2	Journal of International Financial Markets, Institutions and Money	1
Forest Policy and Economics	2	Journal of Macroeconomics	1
International Journal of Sustainable Economy	2	Journal of Productivity Analysis	1
Journal of Asian Finance, Economics and Business	2	Journal of Transport Economics and Policy	1
Journal of Environmental Economics and Management	2	Oxford Review of Economic Policy	1
Marine Policy	2	Singapore Economic Review	1
Accounting Review	1		

3.3 Authors and country origin

According to the authors' study of 167 papers on carbon emissions, those manuscripts were written by 303 writers. Only 6.09 percent of the articles were written by a single author, while 93.91 percent of the articles were written in collaboration by two or more authors. Between 2016 and 2021, each author authored an average of 0.54 article. Only 6 authors (3.65%) have published more than 5 articles, with 83.11 percent having one article, 10.03 percent having two articles, 6.86 percent having more than three articles. According to the aforementioned figures, Wang, Zhang, Geng, Huan, Li, and Liu (all Chinese) have produced 9, 7, 7, 6, 6, and 6 articles, respectively. It was discovered that between 2016 and 2021, these authors published the most publications. (Fig. II).

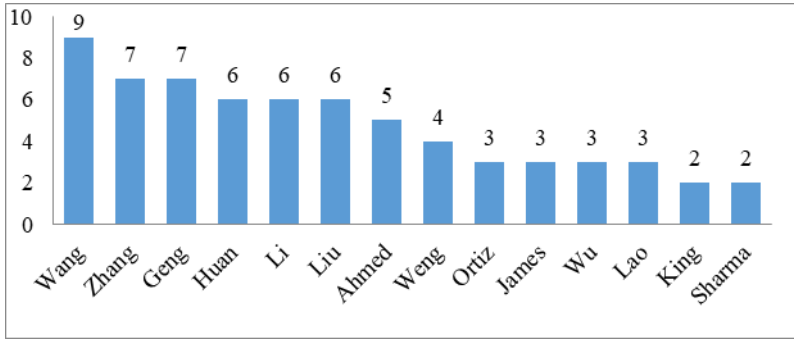


Fig. 2. Top researchers working on Carbon emission.

A total of 167 articles were published by 303 writers from 30 different countries between 2016 and 2021. The most productive and influential country was China followed by Turkey, United Kingdom and United States. China (45.12 percent), Turkey (9.01%) United Kingdom (7.92 percent), the United States (7.31 percent), Australia (5.48 percent), and India (3.65 percent) accounted for about 78.52 percent of the articles. Furthermore, we discovered that the number of publications from writers with ties to Africa (3.65%) and Oceania (0.6%) is extremely low. Figure 3 depicts the trend of publications in carbon emission articles by author's country of origin.

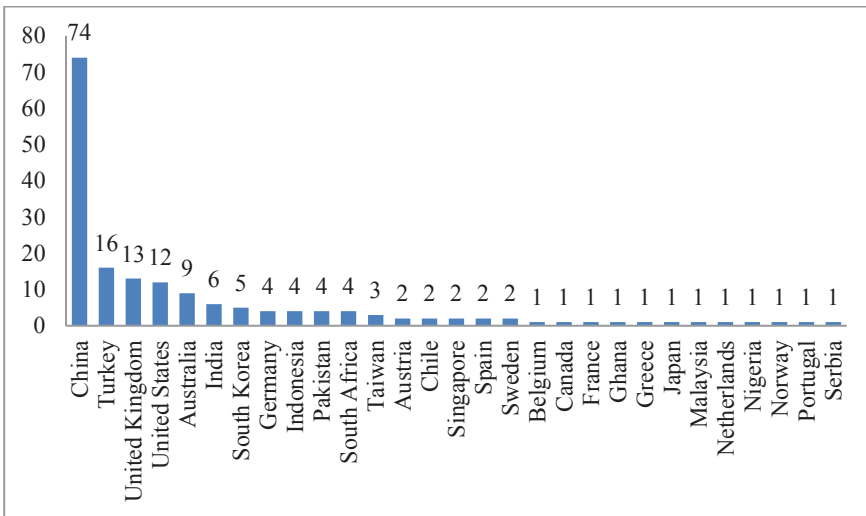


Fig. 3. Top countries with regard to Carbon emission publications.

3.4 Top Research Institutions and influential articles

According to the findings of this study, 51 institutions have contributed to studies on low carbon emissions. The top eight institutions are depicted in Figure 4, with Tsinghua University leading the way with ten articles out of a total of 167 (5.9 percent). With 7 (4.2 percent), 4 (2.3 percent) publications, respectively, Beijing Institute of Technology and Quaid-I-Azam University and Jiangsu University (both of them are 4) are close behind. National University of Singapore, Sun-Yat-Sen University and University of Windsor each have 3 (1.7 percent) publications, while University of Limpopo has 2 (1.2 percent) publications.

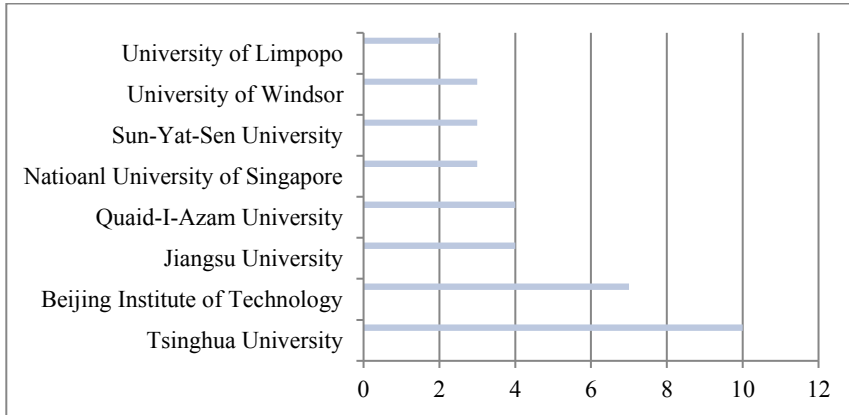


Fig. 4. Emission Based on citation analysis, the most influential authors.

Table 2. Top researchers in terms of citations.

Rank	Authors	Title	Citations
1	Zhu, H. Duan, L. Guo, Y.	The effects of FDI, economic growth and energy consumption on carbon emissions in ASEAN-5: Evidence from panel quantile regression	258
2	Shahbaz, M. Nasreen, S. Ahmed, K. Hammoudeh, S.	Trade openness–carbon emissions nexus: The importance of turning points of trade openness for country panels	143
3	Dong, F. Yu, B. Hadachin, T. Dai, Y. Wang, Y. Zhang, S. Long, R.	Drivers of carbon emission intensity change in China	130
4	Bazan, E. Jaber, M.Y. Zaroni, S	Carbon emissions and energy effects on a two-level manufacturer-retailer closed-loop supply chain model with remanufacturing subject to different coordination mechanisms	117
5	Yang, L. Zhang, Q. Ji, J.	Pricing and carbon emission reduction decisions in supply chains with vertical and horizontal cooperation	117

3.5 Future research on carbon

Several suggestions for future study work can be made based on the findings of this review, the results of the scientometric analysis, and the discussion. According to the findings of a scientometric investigation, China places a strong emphasis on carbon emission-related research. Despite the fact that China is the world's largest carbon emitter, academics should concentrate their efforts on other countries such as the United States, Australia, and the United Kingdom. Furthermore, a scarcity of research in developing countries was looming. As a result, developing countries should perform more study on carbon emission-related issues. Researchers in China, in particular, were primarily interested in investigating emission in the Chinese setting. To acquire a greater understanding of global carbon emissions, these researchers should expand their research projects to other countries.

4 Conclusion

CO₂ is an odorless gas that is vital to life on the planet. CO₂, often known as a greenhouse gas, can disturb the natural regulation of temperature in the atmosphere, resulting in global warming (Saka et al, 2014).

As a result of the industrial revolution and the exponential growth of manufacturing activity around the world, CO₂ concentrations have risen significantly (Choi, 2013). The chief sources of CO₂ are deforestation, agriculture, and fossil fuel use. According to the Global Carbon Project's most recent data, China, the United States, India, Russia, and Japan are the top five countries that produce the most CO₂ (Al – Mulali and Ozturk, 2015).

The largest contributor to the climate change challenge is business carbon emissions. Climate change is a possibility when there is a large amount of carbon emissions (Emodi et al, 2015). Global warming and climate change are worldwide issues (Friedrich et al, 2015). Because reducing carbon emissions has the potential to be a critical factor in ensuring the long-term viability of businesses, are more likely to establish a management system that can control carbon emissions, assess the risk of carbon emissions as well as resolving the issue of carbon emission (Shaymal et al, 2004).

The number of papers published on carbon emissions has continuously climbed over the last five years, with an average of 27 articles per year published between 2016 and 2021. However, because the year 2021 has not yet ended, this index may rise.

China's efforts have mostly contributed to this continuous rise, and Chinese publications account for the majority of the articles we've seen.

Six journals published 65.68 percent of the publications examined (103 articles): Energy Economics, International journal of energy economics and policy, Structural Change and Economic Dynamics, "Environment, Development, and Sustainability," International Journal of Production Economics, and Ecological Economics.

Authors from China, the United Kingdom, the United States, Turkey, Australia, and India were responsible for 78.52 percent of the carbon emission assessment studies.

References

1. S. Abolhosseini, A. Heshmati, J. Altmann, IZA Discussion Paper **7989** (2014)
2. U. Al-Mulali, I. Ozturk, H. H. Lean, *Natural Hazards* **79(1)**, 621 (2015)
3. A. S. Alshehry, M. Belloumi, *Renewable and Sustainable Energy Reviews* **41**, 237 (2015)
4. K. Appiah, J. Du, M. Yeboah, R. Appiah, *International Journal of Energy Economics and Policy* **9(2)**, 237 (2019)
5. J. M. Balogh, A. Jám bor, *International Journal of Energy Economics and Policy* **7(5)**, 217 (2017)
6. Z. Borghei-Ghomi, P. Leung, *Accounting and Finance Research* **2(1)**, 110 (2013)
7. G. A. Boyd, D. A. Hanson, T. Sterner, *Energy Economics* **10**, 309 (1988)
8. B. B. Choi, D. Lee, J. Psaros, *Pacific Accounting Review* **25(1)**, 58 (2013)
9. N. V. Emodi, K. J. Boo, *International Journal of Energy Economics and Policy* **5(2)**, 565 (2015)
10. J. Friedrich, M. Ge, A. Pickens, This Interactive Chart Explains World's Top 10 Emitters, and How They've Changed. World Research Institute. (2017), <https://www.wri.org>

11. A. G. Georgantopoulos, *International Journal of Energy Economics and Policy* **2(4)**, 263 (2012)
12. C. L. Huang, F. H. Kung, *Journal of Business Ethics* **96(3)**, 435 (2010)
13. EPA, Year in Review 2017-2018 (2017):
https://www.epa.gov/sites/production/files/2018-03/documents/year_in_review_3.5.18.pdf
14. IPCC. *Climate Change: Mitigation of Climate Change* (2014), <http://www.ipcc.ch/report/ar5/wg3>
15. J. Kraft, A. Kraft, *Journal of Energy Development* **3**, 401 (1978)
16. A. Mardani, D. Streimikiene, M. Nilashi, D. A. Aranda, N. Loganathan, A. Jusoh, *Energies* **11(10)**, 2771 (2018)
17. L. H. Martinez, *Journal of Land Use and Environmental Law* **20(2)**, 403 (2005)
18. H. T. Pao, H. C. Fu, C. L. Tseng, *Energy* **40(1)**, 400 (2012)
19. S. M. Obadi, M. Kor, *International Journal of Energy Economics and Policy* **5(2)**, 422 (2015)
20. N. M. Odhiambo, *Journal of Energy Policy* **38**, 2463 (2010)
21. H. Sasana, A. E. Putri, *E3S Web of Conferences* **31**, 01008 (2018)
22. C. Saka, T. Oshika, *Management and Policy Journal* **5(1)**, 22 (2014)
23. P. Shyamal, N. B. Rabindra, *Journal of Energy Economics* **26**, 977 (2004)
24. A. Rokhmawati, A. Gunardi, *International Journal of Energy Economics and Policy* **7(4)**, 181 (2017)
25. A. Rokhmawati, A. Gunardi, M. Rossi, *International Journal of Energy Economics and Policy* **7(6)**, 85 (2017)
26. C. F. Tang, B. W. Tan, I. Ozturk, *Renewable and Sustainable Energy Reviews* **54**, 1506 (2016)
27. Y. Twumasi, *Archives of Current Research International* **7(1)**, 1 (2017)