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Bibliometric Analysis of Studies on the Relationship Between Environmental Quality, Economic Growth and Health

Çevresel Kalite, Ekonomik Büyüme ve Sağlık İlişkisi: Bibliyometrik Bir Analiz

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ABSTRACT

Economic growth impacts environmental quality based on how natural resources are used. The change in environmental quality is thought to be related to public health. This study examines 2041 publications from 1991 to 2023 through bibliometric analysis using the VOS Viewer software. The analysis focuses on publications related to economics, identified using the keywords "Environmental Quality, Economic Growth, and Health" in the Web of Science database. The key point of this study is aimed to have a detailed literature review of the line between economic growth, environmental quality, and health. As a conclusion, it is believed that "there is a need for studies examining the economic causes and consequences of environmental quality, economic growth, and health to become widespread nexus" For the studies to be widespread, previous studies on this subject should be searched and necessary gaps should be identified. Final aim is to provide to make offers to fill the gaps in the literature.

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ÖZ

Ekonomik büyüme, doğal kaynakların nasıl kullanıldığına bağlı olarak çevre kalitesini etkilemektedir. Çevre kalitesindeki değişim ise halk sağlığı ile yakın bir ilişki içindedir. Bu çalışmanın temel amacı, VOS Viewer programını ve bibliyometrik analiz yöntemini kullanarak çevresel kalite, ekonomik büyüme ve sağlık ilişkisini ele alan 1991-2023 yılları arasında yayınlanmış çalışmaları incelemektir. Web of Science veri tabanında "çevresel kalite, ekonomik büyüme ve sağlık" anahtar kelimeleriyle tarama yapıldığında ekonomi ile ilgili 2041 çalışma-

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nın yayınlandığı görülmektedir. Analizin odak noktası ekonomik büyüme, çevre kalitesi ve sağlık ilişkisine ait ayrıntılı bir literatür incelemesinin yapılmasıdır. Sonuç olarak, "çevresel kalite, ekonomik büyüme ve sağlığın ekonomik neden ve sonuçlarını inceleyen çalışmaların yaygınlaşmasına ihtiyaç olduğu" düşünülmektedir. Çalışmaların yaygınlaşması için bu konuda daha önce yapılmış çalışmalar araştırılmalı ve gerekli eksiklikler tespit edilmelidir. Böylece konuya ilişkin literatürdeki boşlukların fark edilmesi ve bu boşlukları dolduracak çalışmaların yapılması mümkün olabilir.

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1. INTRODUCTION

Economic growth and environmental quality are common and current research areas. Discussions that began with the Environmental Kuznets Curve have affected other branches of science outside economics over time. The importance of the theory of sustainable development and the emphasis on the environmental dimension of sustainable development has increased the importance of the subject even more. The relationship between economic growth and environmental quality affects different indicators, necessitating the examination of a more complex relationship network. For this reason, when we look at recent studies, we see that in addition to economic growth and environmental quality, issues such as tourism, financial stability, renewable energy resources, and health are also crucial. Researchers try to examine how these different issues affect each other. The nexus of economic growth, environmental quality, and health is a relatively new research title, and the literature on this topic continues to expand (Ibukun and Osinubi, 2020).

The literature on this topic is divided into four basic groups. The first group contains the studies which have environmental quality and economic growth nexus. The second group wraps up the studies researching the relationship between environmental quality and health. The third group includes studies focusing on the relationship between health and economic growth. Studies examining the relationship between environmental quality, economic growth, and health together form the fourth group (Vyas et al., 2023). There are 11,647 publications on environmental quality and economic growth, 123,144 on environmental quality and health, and 24,917 on health and economic growth. The number of studies published on environmental quality, economic growth, and health is 2,041.

When bibliometric analysis studies on the subjects are examined, the importance of this study becomes clearer. The number of bibliometric analyzes on environmental quality and economic growth is 39, the number of bibliometric analyzes on environmental quality and health is 219, and the number of bibliometric analyzes on health and economic growth is 73. The number of bibliometric analyzes on environmental quality, economic growth, and health is only 7. One of these studies was published in 2019, three in 2020, and three in 2021. There is no bibliometric analysis studies published in 2022 and 2023. However, when we try to learn the number of studies published on the subject in 2022 is quite high, and the number of studies is expected to increase rapidly in 2023. Therefore, bibliometric analysis containing the most up-to-date data may be useful for future studies.

This study analyzes publications related with environmental quality, economic growth, and health nexus. The Web of Science database and VOS viewer package program were used in the bibliometric analysis. The analysis compiles and presents different types of information to researchers, such as the number of publications by year, the most cited sources, the areas in which the studies are concentrated, and the most used keywords.

In the first part of this study, the theoretical basis of the interaction between environmental quality, economic growth, and health was examined. It is explained by which channels the concepts affect each other, in what direction, and how the relationship between them occurs. The next section is made up of a literature review. Environmental quality, economic growth, and health nexus is a common research area different scientific discipline. Sustainable sciences, environmental sciences, biology, forest sciences, and economics are the branches of science with the highest number of studies on the subject. A search in the Web of Science database using the keywords "environmental quality, economic growth and health" lists 2041 studies. To clarify the scope of bibliometric analysis, this article focuses on studies conducted in the field of "economy". Category selection was made considering the scope of the study, and studies in the "Citation Topics Meso" category were selected to examine the largest number of studies possible. According to the "Citation Topics Meso" category, there are 67 studies on "environmental quality, economic growth and health" in the field of economics. In the literature review, basic information about these 67 studies, such as purpose, data set, method, and findings, was included.

In the next section, the outcomes gained from the bibliographic analysis are underlined. This section includes important numerical information such as the number of

publications by year, distribution of publications by document type, distribution by subject categories and publication language, and index distribution of publications. In addition, the countries that publish the most and the most cited studies are included in this section. In the last section, maps prepared using the VOS viewer program are included, and elements such as co-authorship and the most frequently used keywords are presented by visualizing.

2. RELATIONSHIP BETWEEN ENVIRONMENTAL QUALITY, ECONOMIC GROWTH AND HEALTH

Human health has an important role in economic policies and development strategies. There are two fundamental reasons for this. The first reason is that human labor is the most abundant factor in production. Problems with labor supply may arise in a society with low health levels. Human labor is the most abundant factor in production, and inadequate health levels in a society can lead to problems in labor supply. Second, health is a component of investments in human capital. Indicators that reflect health significantly impact human capital investments. Due to these effects, to prepare economic policies correctly, it is necessary to know the factors that affect human health and determine how they affect human health. Although there are many factors affecting human health, the relationship between human health and environmental quality has become a widespread research area in recent years (Dhrifi, 2019). When we examine the theoretical framework of the interaction between environmental quality, economic growth, and health, there is a mechanism that operates through the relationship between economic growth and environmental quality. The relationship between economic growth and environmental quality is known in the literature as the "Environmental Kuznets Curve". According to the Environmental Kuznets Curve, in the early stages of economic growth, increased growth increases environmental pollution and causes environmental quality to deteriorate. On the other hand, as economic growth continues to increase, after a certain point, the increase in economic growth begins to increase environmental quality (Anwar et al., 2021). In the starting levels of economic growth, degradation of environmental quality is at its highest. At this stage, the use of non -renewable energy is very high. There is dependence on non -renewable energy types, and environmentally friendly products are not requested. This continues to the top of the inverse U-shaped. Afterwards, a new process begins. In the new process, with the increase in income level, the demand for environmentally friendly products begins to increase. A structure based on a green economy is established, and environmentally sensitive production systems are implemented using technological innovations. Protection of the environment is at the forefront of government policies. According to (Waslekar, 2014), because of all these changes and transformations, environmental deterioration begins to slow down (Waslekar, 2014).

Environmental pollution can have different effects on health. Environmental pollution can elevate healthcare costs, mortality rates, and the risk of fatal and respiratory diseases, while also reducing individual quality of life. Studies have also indicated that a decline in environmental quality is harmful to mental health (Lu et al., 2017).

The studies related with economy, mostly mention that there is a strong link between environmental pollution and health. Deterioration of environmental quality due to increased environmental pollution negatively affects human health. If human health deteriorates gradually, there will be a need to spend more on health to improve the deteriorated health. Thus, total health expenditures will increase (Anwar et al., 2021). The impact of air pollution on health expenses does not only effects individuals. Deterioration of human health due to environmental pollution also increases public health expenses. Particularly in developing countries, individuals have limited access to healthcare services. This situation is more obvious in rural areas. Environmental pollution negatively affects the health of the entire society, but health services in rural areas are less sufficient than in cities. In such a situation, the public sector should increase its investments in the health sector to ensure fair access to health services. This may increase the state's health expenditures and create pressure on the public budget (Zeeshan et al., 2021). In other words, expenditures made to protect the environment reduce health expenditures (Bu and Ali, 2022).

Although there is a close environmental pollution and health expenditures nexus, the way the relationship between these two indicators emerges depends on age. Young individuals tend to prefer long- term investments. Older individuals, on the other hand, tend to invest in investments that yield results in the short term. For this reason, in general, young people prefer environmental expenditures and the elderly prefer health expenditures. The effects of environmental expenditures occur in the long term, and time is needed to improve environmental quality. Young people have a longer time to achieve positive results of improvements in environmental quality. Elderly people, on the other hand, think that they cannot adequately experience the benefits offered by a clean environment; therefore, they turn to health expenses instead of environmental expenses. It may be claimed that older people spend less on environmental costs and more on healthcare costs than younger people. Of course, older people cannot fully disregard environmental costs. Therefore, age-related parameters are crucial in environmental quality and health expenses nexus (Safi and Ben Hassen, 2017).

As it is mentioned that the relationship between environmental pollution and health is also an important research topic in health sciences. Because environmental pollution triggers many diseases. Production processes that ignore environmental quality do not only increase air pollution. It also pollutes the soil, seawater, and groundwater. Each type of pollution has different adverse effects on human health.

If soil pollution increases, agricultural products contain substances that are harmful to health, and consumption of unhealthy fruits and vegetables causes various diseases. Plant and animal diversity is reduced. Pollution of seas, lakes, rivers, and groundwater prevents people from accessing clean drinking water and increases water-borne infections. Air pollution is also considered an environmental disaster by international organizations. Increasing air pollution specially makes respiratory diseases more common. According to estimates by the World Health Organization, 4.2–7 million people die due to air pollution every year in 2022. Research conducted after the recent COVID-19 epidemic revealed that new pandemic diseases will emerge every year if urgent measures are not taken against environmental pollution (Zhang et al., 2022b).

Finally, environmental quality, economic growth, and health nexus is a common topic of study in many different disciplines, from economics to public health, from environmental engineering to atmospheric sciences, and from science technologies to ecology. The indicators that researchers use in the analysis, especially those representing health, are different from each other. Researchers in economics generally use health expenditures, whereas researchers in health sciences use variables such as life expectancy. In this study, we focus on economics. In the research using the Web of Science database, it was observed that there were 67 studies in the "6.10 Economics" category. These studies are outlined in the literature review section.

3. LITERATURE REVIEW

The quality of governance is an effective factor in establishing the relationship between environmental quality, economic growth, and health. The effects of it appear on the level of social welfare, public health, and environmental policies. Thus, governance quality is very important in determining the level of economic and social development (Holmberg et al, 2009). High governance quality may improve socio-economic indicators, whereas low governance quality may cause deterioration in socio-economic indicators. Some researchers have tested this empirically in their studies on European countries. Noja et al. (2019) found that public administration and environmental support policies reduce poverty by increasing per capita income in EU countries. They emphasized the necessity of high governance quality for long-term economic development. In their study on European countries, Rodríguez-Pose and Tselios (2019) revealed that the degree of satisfaction with healthcare services increased in countries with high governance quality, whereas satisfaction with healthcare services did not always increase in countries with low governance quality.

While governance quality affects social and economic indicators, they also affect the level of governance quality. There is a reciprocal interaction between them. Charron et al., (2015) argued that governance quality does not also depend on economic indicators. But also depends on factors such as environmental quality, social development, health, and quality of life should also be included in measuring governance quality. They examined different regions of twenty-four European countries in terms of governance quality by measuring the governance quality using the index they created.

There is also mutual interaction between social and economic indicators and institutional quality. In recent years, awareness of the importance of environmental quality has increased; efforts to protect ecological balances have come to the fore, and the idea that institutional quality plays an important role in increasing environmental quality has become widespread. Liu et al. (2022a) found that institutional quality increases environmental quality in the E7 countries, whereas financial development decreases environmental quality. Institutional quality also reduces the adverse effects of financial development on environmental quality. Nguyen et al. (2022) searched about the effect of environmental quality on institutional quality. The researchers used data from eighty-seven countries in the study, and the environmental quality indicator is CO2 emissions. They found that an increase in CO2 emissions reduces institutional quality. Environmental quality and public health issues also have an influence about institutional quality. The prevalence of diseases in society plays a role in determining institutional quality by affecting the regulation mechanism. According to Gooch et al., (2023) better quality institutions can be established in societies with low disease rates. Low institutional quality is one of the main reasons for the increase in the informal economy. For example, the informal economy in Romania is quite high. The main factors behind the high level of informal economy of the country are the high level of tax avoidance, lack of trust in public officials, insufficient legislation, lack of state support for entrepreneurs, and increase in bribery and corruption. These factors indicate a low level of institutional quality (Popescu et al., 2018).

The idea that indicators related to the environment and health should be included in the measurement of the level of well-being is becoming increasingly widespread. In most studies, researchers use a combination of economic, social, and environmental indicators to measure well-being. However, new variables are added to these, and the diversity in the dataset continues to increase. Risse (2015) stated that welfare indicators should not only depend on GDP values. A measure of well-being, according to the study, should consider social inclusion, environmental quality, and health. De Maya Matallana et al., (2018) added variables related to inheritance and housing to the measurement of well-being. Graafland (2020) revealed that cultural variables and the mutual interaction between official institutions are also factors that determine welfare. Even if there is an improvement in welfare indicators, if the increased level of welfare is not distributed evenly, this inequality may cause various problems. Hao et al. (2021) demonstrated

that increases in income inequality negatively affect public health. Davidescu et al., (2022) found that income inequality negatively affects the quality of life, and they stated that income inequality should be reduced to increase the quality of life.

The main factors that are vital in determining health efficiency are per capita income, fees for access to health services, air pollution, and climate. Zhai and Ge (2015) used provincial data covering the period 2010–2013 in their research on China. They demonstrated that reducing air pollution positively affects health efficiency and increases health investments. In another study examining health efficiency, the authors found that an increase in health expenditures increased health efficiency in OECD countries. The distribution of financial resources should be optimal, and the quality of health financing management should be improved (Ivankova et al., 2020). Kim et al., (2020) also emphasized the importance of optimal distribution of financial resources and examined the factors affecting the efficiency of investments in health services for Asian countries. They concluded that investment and management conditions in a country affect the productivity of investments in the health sector.

Health investments are one of the factors that influence economic growth. Fotourehchi and Ebrahimpour (2019) studied the effects of health investments, human capital, and environmental capital on economic growth in developing countries. They found that health indicators have high effects on economic growth. They proposed a development strategy that focuses on health investments in developing countries. Additionally, investments in the healthcare sector, total healthcare expenditures affect economic growth. Nafngiyana and Rahayu (2019), in their study on ASEAN countries, found that there are simultaneous effects between health expenditures and per capita income. They also showed that increasing per capita income increases CO2 emissions which effects in health expenditures. Ecevit et al. (2023) revealed that the main factors affecting health expenditures are the rate of the elderly population, economic growth, greenhouse gas emissions, and globalization. Aging of the population increased economic growth, and increased greenhouse gas emissions increase health expenditures. Globalization has decreasing effects on health expenditures.

Regional analyses are becoming increasingly environmental quality, economic growth, and health nexus. Analyses showed that there were generally regional differences and a heterogeneous distribution between them. Du et al., (2019) measured the green innovation efficiency of companies in China. They found imbalances between regions according to the effect of green innovation. The productivity of the northeastern region is the lowest, whereas the productivity of the eastern and western regions is higher than that of the central regions. There are regional differences in total green factor productivity in China. Environmental regulations and digitalization have positive effects on increasing factor productivity. Total green factor efficiency can be increased through regionally differentiated environmental policies and digital transformation (Huang et al., 2022; Zhao et al., 2022). The heterogeneous distribution of total green factor efficiency in China is also available for total green factor energy efficiency. Ma et al. (2022a) conducted research on the Yangtze River Economic Belt in China. According to this study, there are some differences about spatial and temporal in the green total factor energy efficiency in this region. Economic growth, energy structure, and human capital increase green total factor energy efficiency. Ren and Chen (2022) also examined total green factor productivity but conducted a sector-based rather than regional research. They found that the green total factor efficiency of China's maritime economy has increased over time. Technological innovations have a positive and effects significantly on the green total factor efficiency. The effects of environmental regulations vary depending on their intensity.

Zhao et al. (2020) demonstrated spatial differences in the distribution of health levels in China. They also concluded that although the general health level in the country has increased, the local health level has deteriorated.

There are also differences in regions about eco-efficiency. Economic, social, and environmental factors are often used together in measuring eco-efficiency. Therefore, eco-efficiency is important in the relationship between environmental quality, economic growth and health. In the Western Taiwan Strait Economic Region, eco-efficiency is highest in the eastern regions. Economic growth, market openness, population density, and industrial structure positively impacts eco-efficiency. The effects of energy intensity and science and technology expenditures on eco-efficiency are negative (Zhu et al., 2019). Similarly, some researchers have determined that the eastern region of China has the highest eco-efficiency. There are regional differences in eco-efficiency across the country (Ren et al., 2020).

Ru et al. (2020) and Shi et al. (2021) measured the efficiency of the economic growth process and revealed the regional distributions of this productivity. Ru et al. (2020) found that the quality of economic growth decreases in China as one moves from east to west and from the center to remote regions. Increasing environmental quality also contributes to improving economic growth in terms of quantity, quality, and productivity. Shi et al. (2021) also reached similar results; their study showed large differences in economic growth efficiency across provinces in China. The main reasons for this difference are resource equipment, industrial structure, geographical environment, and strategic adaptation. According to their recommendations, provinces should establish their own policies based on their own efficiency outcomes.

Among the factors affecting energy efficiency and environmental efficiency, the effect of resource dependence is quite high. High resource dependence reduces energy and environmental efficiency (Hu et al., 2020). Studies examining the factors affecting environmental quality have

focused on which factors affect environmental quality in which direction. Strengthening road infrastructure has seen as a positive impact on economic growth. However, increasing carbon emissions decreases environmental quality. Decreasing environmental quality negatively affects economic growth (Sharif and Tauqir, 2021). Low efficiency of resource allocation is also a factor that negatively affect environmental quality. For this reason, in some studies, it can be stated that the development approach that focuses only on the speed of economic growth should be abandoned, and the development approach that emphasizes both the speed and quality of growth should be adopted. A development approach that only considers the speed of economic growth exacerbates the inefficiency in resource allocation (He and Qi, 2021). Although economic freedom also affects environmental quality, this effect may differ in the short and long term. Majeed et al. (2021) found that economic freedom has not affected on environmental quality in the short term in Pakistan, but it increases environmental quality by reducing air pollution in the long term.

Disseminating green technologies, using renewable energy, green credit allocation, and adapting to the digital economy are of great importance in improving environmental quality. Social trust positively affects green technology innovation. By enhancing social trust, it is possible to develop green technology innovation and improve environmental quality (Yang et al., 2021). In some countries, funds have been created to encourage the use of renewable energy resources. Whether these funds are used efficiently and for their intended purpose should be inspected, and penalties should be imposed when necessary. Mugambi et al. (2021) examined the productivity of these funds. They found regional differences in the use of these funds in Spain. Cao and Niu (2022) found that green loans affect environmental quality by improving the total factor carbon emission performance. Fang et al. (2023) determined that the digital economy positively affects environmental efficiency and quality. In addition to the digital economy, technological innovation and the level of pollution control have a positive impact on environmental efficiency.

The media is also an important factor in increasing environmental quality. Media coverage of environmental pollution can improve public health and support economic growth by raising environmental awareness (Li et al., 2021).

Measuring the efficiency of these factors is as important as determining the factors that increase environmental quality. Zhu and Wang (2022) measured the efficiency of the green transformation. Yao et al., (2022) measured the efficiency of industrial green technology innovation. Researchers have attempted to reveal the change in productivity over time. Zhou et al., (2022) measured the effectiveness of green policies. They concluded that foreign investments are an important factor that affects the effectiveness of green policies and the growth rate of green production. Dong et al. (2022) investigated changes in industrial transformation and urban economic productivity over time. According to the analysis, the scope and speed of industrial transformation in the Yangtze River economic belt have decreased over time. The impact of industrial transformation on economic efficiency is gradually weakening. Xu et al. (2023) examined the effectiveness of the green development strategy in China. According to the analysis, economic underdevelopment at the local level and low industrial earning rates restricts the efficiency of the green development strategy.

Regional disparities in environmental, economic, and social indicators are also important for economic policies. Kumari et al., (2023) examined regional disparities using social, economic and environmental indicators. Regional heterogeneity exists in social, economic, and environmental indicators in India. States in the central and eastern regions of India are less developed than those in other regions. The fact that the factor allocation efficiency of regions and cities is different causes their economic development to also differ. Xu et al., (2022) measured the factor allocation efficiencies of mining cities in China. Mining cities have a heterogeneous distribution of factor allocation effectiveness and convergence rates. They stated that increasing the efficiency in resource allocation is not enough to ensure economic development in mining cities and that the group environment must also be improved.

Regional disparities also affect the success on sustainable development goals. Pan et al. (2023) examined how regional differences in economic development and migration affect the success of sustainable development goals through the example of Tibet. They determined that migration has direct negative and indirect positive impacts on the overall sustainable development score. Various socioeconomic and environmental indicators such as migration, GDP, health, employment, agricultural productivity, population, ecosystem services, and vegetation affect the sustainability process by determining regional differences.

There are also studies that claim that rapid economic growth will increase regional imbalances. A strategy that prioritizes the industrial sector and does not attach importance to environmental protection causes imbalances in urbanization even if it provides rapid economic growth. A services sector-oriented strategy that attaches importance to environmental protection may not guarantee price stability although it provides balanced urbanization (Huang et al., 2020). In addition, as rapid economic growth causes high air pollution, differences efficiency occurs between regions and cities (Li et al. (2020). Although economic growth causes environmental pollution, it can positively affect health indicators. Li and Shen (2022) also revealed that economic growth leads to improvement in health standards, whereas the deterioration of environmental quality negatively affects health standards. The level of industrialization, urbanization, and economic growth are also factors that affect the effectiveness of pollution control. Guo et al. (2022) demonstrated a positive relationship between the level of urbanization– industrialization and

the effectiveness of urban– industrial pollution control in China. The relationship between economic development and the efficiency of urban and industrial pollution control is U-shaped.

Atisa and Racelis (2022) conducted another study that mentions the investigation of the degree of urbanization. Researchers have stated that economic, social, and environmental problems have emerged because of climate change. Urbanization is an important tool for solving these problems. However, they emphasized that the opportunities of urbanization were not used sufficiently. There is a need for policies that will create regional resilience.

Factors such as economic development, income level, export structure, and regional grouping determine the effects of natural resource dissension on human development. Empirical evidence indicates that natural resource rents in developing countries have a direct and positive impact on human development. Despite this, the relationship between them may differ depending on the factors considered (Nchofoung et al., 2021). Natural resource rents also affect countries' national savings rates. Ullah et al. (2022) revealed that natural resource rents increase countries' national saving rates but cause natural resources to decrease.

Deficits in food production and security are the source of regional variations. To increase food production and ensure food security, infrastructure deficiencies must be eliminated, and qualitative indicators must be improved. Datta et al. (2017) evaluated a program called MGNREGS, which is implemented in India and increases rural employment. They stated that the program was unsuccessful enough to increase food production. Inadequacy in food production can disrupt economic and social balances. Pilipuk et al. (2020) examined food security through a Belarusian example. They stated that the country has resource potential for agricultural production, but resource efficiency should be increased.

Socioeconomic status, work stress, and inequalities in the healthcare system negatively affect the functionality of older individuals. Reinhardt et al., (2013) conducted research on European nations. They revealed that inequalities in the healthcare system and work stress should be reduced so that individuals can continue their functionality for many years. There is another study that examines the work environment and working conditions. In the study, the author found that integrating social innovations into business life and implementing health protection programs are extremely effective in increasing the satisfaction level of employees (Leonidova, 2022). Overeducation, on the other hand, negatively affects employees' job satisfaction, affecting their working life, workforce productivity, and health level (Ma et al., 2022b).

Environmental, economic, and social indicators create trade-obstructive effects. Mahdi Ghodsi (2018) explored the main reasons for technical barriers to trade in the EU. The author revealed that aims such as improving environmental quality, protecting human health, improving market efficiency, and protecting domestic industry hinder trade. Environmental, economic, and social indicators can inhibit not only trade but also pro-poor growth. Khan et al. (2019) conducted a comprehensive analysis that included environmental factors, energy resources, health and education, and sectoral added value into the pro-poor growth analysis. The negative impact of environmental factors and sources in energy on the quality of life of the poor is very high.

The effects of environmental, economic, and social indicators may not occur in the same way in all groups of society. For this reason, some studies have focused on different groups of society and examined smaller groups. Schaefer (2020) investigated the effects of environmental pollution on children. The author concluded that environmental pollution reduces the likelihood of children's survival. Economic conditions effect children's exposure to environmental pollution. Because generally, families with high-income levels live in clean areas with low levels of environmental pollution. Liu et al., (2022b) examined households with low income. They showed that the effects of health shocks and health insurance differ according to income level. The negative effects of health shocks are greater in households with low incomes. Households that do not have health insurance are less inclined to invest in risky financial assets. In another study examining financial trends and the reasons affecting the development of the financial system, the authors addressed social shocks, political instability, natural disasters, and inadequacies in health services and infrastructure. They stated that these factors may pose a threat to financial development (Nguyen et al., 2023).

One of the factors that improve environmental, economic, and social indicators is the high competitiveness of countries. Ben Amor and de Miguel Gomez (2018) examined this using the example of Spain. Spain's highly competitive power in tourism sector and it has importance in its economic, social, and environmental development. Zhang et al. (2022a) discussed the effectiveness and competitiveness of the tourism industry. They emphasized the relationship between tourism development and environmental quality. To improve the efficiency of tourism, they recommended focusing more on managerial reform and technical advancements.

Overall, there are many economic studies on China examining environmental quality, economic growth, and health nexus. The number of regional comparisons is increasing. Table A1 summarizes studies between environmental quality, economic growth and health nexus. The table is shown as an appendix.

4. METHODOLOGY

Nowadays, basic reasons such as technological developments reducing access barriers, rapid social and economic change, and the increase in multidisciplinary studies also

affect the literature. New concepts are emerging within the research area of different sciences, and many theoretical and empirical studies are being conducted on these concepts. The ongoing growth in the number of scientific publications makes it increasingly difficult to track of these publications. Many publications, including articles, books, proceedings, and other publications, are shared with researchers. Therefore, bibliometric analyzes are a very useful method in terms of guiding researchers and grouping information into different categories (Vogel, 2014). Bibliometric analysis consists of several stages. These stages can be listed follows (Bertoglio, 2021).

- Study design: The main questions of the research are determined, and the period that the research will cover is decided.
- Data collection: It is determined which database will be used to collect data regarding publications and which keywords to search with.
- Data preparation: The dataset is filtered and preprocessed for analysis.
- Data analysis: The selected data are analyzed with the help of tools used in bibliometric analysis.
- Data visualization: The data are visualized using appropriate visualization tools, and network maps are added.
- Interpretation: By analyzing the visually represented data, conclusions can be drawn.

The stages implemented in this study are as shown in Figure 1. First it has been decided which keywords will be searched. Then, it was decided which database would be used. In the third stage, it was determined which years' publications would be included in the analysis and which subcategory to focus on. The analysis results were explained using indicators, and maps were created. In the last section, the results are interpreted and pathways for future studies are presented. The methodology of this study is the examining 2041 publications published 1991–2023 using the bibliometric analysis method with VOS viewer package program. We focus on 2041 publications related with economics, which are searched by the keyword "Environmental Quality, Economic Growth, and Health" on the Web of Science database. The key point of this study is aimed to have a detailed literature review of the line between economic growth, environmental quality, and health.

Bibliometric analyses are vital for identifying trends in academic publications over time. Using bibliometric analysis, information can be obtained about different elements such as connection strength between countries and authors, keywords, citation analysis, publication, and author information. Bibliometric analysis can be performed using different databases such as Web of Science and Scopus (Alsharif et al., 2020).

5. RESULTS

This study, in which bibliometric analysis is performed, consists of two main stages. In the first stage, the information pooled from the Web of Science database was shown in tables and graphs. In the second stage, the data obtained from the database were visualized using the VOS viewer package program. A study was performed in the Web of Science database using the keywords "Environmental Quality, Economic Growth and Health". When these keywords were used, it was concluded that there were 2041 studies (Table 1).

First, the distribution of studies on this subject by years was examined. Before explaining the findings, it is important to emphasize something important about the content of the analysis. The data in this study include not only articles

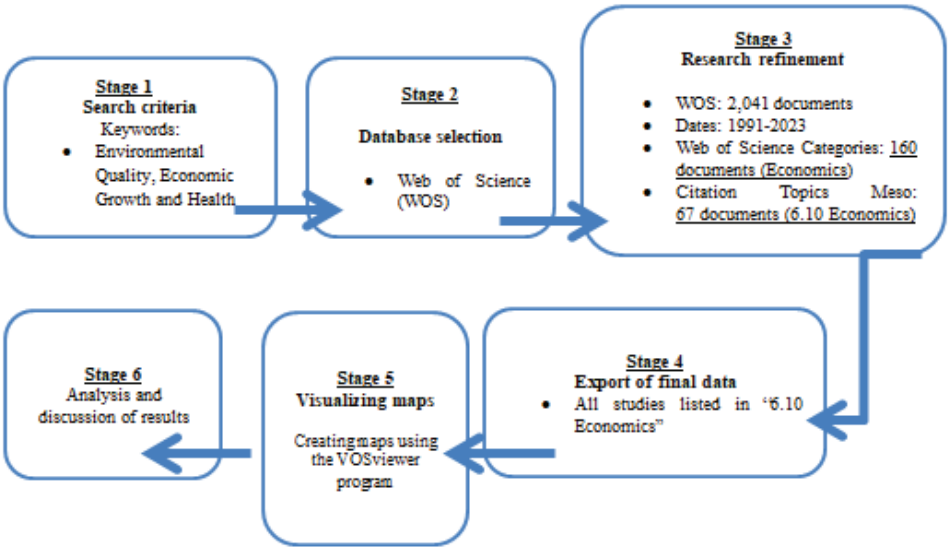

Figure 1. Stages of bibliometric analysis.
Source: Ruiz-Real, 2018: 3.

Table 1. Publications on environmental quality, economic growth and health according to years

Year	Number of publications	Year	Number of publications	Year	Publication
1991	1	2002	4	2013	46
1992	2	2003	10	2014	49
1993	1	2004	9	2015	74
1994	4	2005	11	2016	77
1995	2	2006	14	2017	116
1996	5	2007	24	2018	130
1997	8	2008	19	2019	172
1998	4	2009	35	2020	251
1999	14	2010	24	2021	309
2000	3	2011	45	2022	370
2001	11	2012	40	2023	157

Source: Web of Science

but also other document types. Because document types other than articles on the subject constitute approximately 20% of the total studies. Because this rate is quite high, the analysis includes all document types.

As can be seen in Table 1, the first study on environmental quality, economic growth and health was published in 1991. The number of studies was below 10 per year during 1991–1998. The number of studies published in 1999 was 14. In the period after 1999, the number of studies did not fall below 10, except in 2000, 2002 and 2004. In 2015 and 2016, the number of studies exceeded 70, and in 2021 and 2022, it exceeded 300. The number of studies published until August's 23rd 2023 is 157.

Studies on the subject have increased gradually over time, and the number of studies has increased significantly, especially in 2017 and after. The increase in the number of studies can be seen more clearly in Figure 2. There are lots of studies were published in 2022. The number of studies in 2022 is 370.

Another indicator in bibliometric analyzes is the distribution of studies by document type. Table 2 shows how many studies of which type of document have been published and the ratio of these studies to the total number of studies. Of the 2,041 studies, 1,652 are 80.94% of the total studies are articles. Review articles rank second, and 232 studies of this type of document have been published. The share of research articles in all studies is 11.37%. There are 182 studies in the Proceeding Paper and 52 studies in the Book Chapters.

The distribution of the studies according to Web of Science categories is an essential part of the bibliometric analysis. Examining the subject by researchers in different sciences and having different disciplines in a common field of study increases the number of published studies. The Web of Science database has different categories. Table 3 shows the distribution of studies on environmental quality, economic growth, and health according to the Web of Science category top 10 categories with the most publications are included. According to the table, the category with

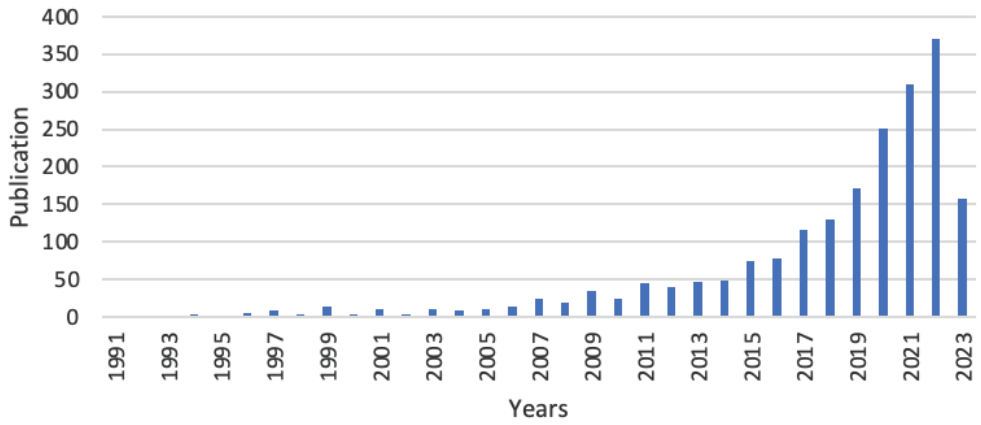

Figure 2. Publications on environmental quality, economic growth, and health according to years.
Source: Web of Science.

Table 2. Distribution of Document Types

Document type	Number of documents	Percentage (%)
Article	1652	80.94
Research Article	232	11.37
Proceeding Paper	182	8.92
Book Chapters	52	2.55
Early Access	28	1.37
Editorial Material	10	0.49
Correction	1	0.05
Meeting	1	0.05
Retracted Publication	1	0.05

Source: Web of Science

the most publications is Environmental Sciences. There are 945 publications in this category, and the ratio of these publications to the total number of publications is 46.30%. Public environmental occupational health, environmental studies, and green sustainable science technology are the fields of science that follow this one. Publications in Economics account for 7.84% of the total publications.

Another category used in Bibliometric analyses is "Citation Topics Meso". Table 4 shows the numerical information about the different fields in this category. The table includes the top ten fields with the most publications. Sustainability Science is the first with 442 publications. Publications in Sustainability Science comprise 21.66% of the total publications. The second is Environmental Sciences, and the third is Marine Biology. Hospitality, Leisure, Sport & Tourism is in tenth place, with 37 publications. The number of publications in Economics is 67. As stated before, this study focused on publications in the field of economics, and these 67 studies are briefly explained in the literature review.

The number of publications in the "Citation Topics Micro" category is listed in Table 5. The first place is the Environmental Kuznets Curve with 376 publications. Aerosols comes next with 95 publications. There is a sharp difference in the number of publications in the first and second places. Afterwards, the gap decreased. For example, the number of publications in Data Envelope Analysis is 27and that in Corporate Social Responsibility is 26.

Index information of the journals or books where the studies are published is another important criterion. 1486 of the studies, as shown in Table 6, were published on the sites covered by Science Citation Index Expanded (SCI-EXPANDED). This represents 72.81% of all studies. The second most popular index type is the Social Sciences Citation Index (SSCI). There have been published 852 studies on the topic that fall under the purview of this index. Only 2 studies have been published on sites that fall under the Arts & Humanities Citation Index (A&HCI), which is the last-place index type. Their proportion in the total studies is below 1%.

Another indicator on which the Web of Science database provides information is the distribution of the studies conducted by country. Table 7 lists the countries that have contributed the most to studies on environmental quality, economic growth, and health. China ranks first among the top 10 countries. The number of studies conducted in China

Table 3. Web of Science categories (top 10)

Web of Science categories	Number of documents	Percentage (%)
Environmental Sciences	945	46.30
Public Environmental and Occupational Health	354	17.34
Environmental Studies	216	10.58
Green Sustainable Science Technology	202	9.90
Economics	160	7.84
Engineering Environmental	122	5.98
Water Resources	95	4.65
Meteorology and Atmospheric Sciences	72	3.53
Energy Fuels	67	3.28
Ecology	66	3.23

Source: Web of Science

Table 4. Citation topics meso (top 10)

Citation Topics Meso	Number of documents	Percentage (%)
6.115 Sustainability Science	442	21.66
8.124 Environmental Sciences	223	10.93
3.2 Marine Biology	89	4.36
3.40 Forestry	84	4.12
6.10 Economics	67	3.28
3.45 Soil Science	65	3.18
3.91 Contamination & Phytoremediation	51	2.50
3.51 Dairy and Animal Sciences	48	2.35
6.153 Climate Change	46	2.25
6.223 Hospitality, Leisure, Sport & Tourism	37	1.81

Source: Web of Science

Table 5. Citation topics micro (top 10)

Citation topics meso	Number of documents	Percentage (%)
6.115.234 Environmental Kuznets Curve	376	18.42
8.124.10 Aerosols	94	4.61
8.124.552 Air Pollution	94	4.61
3.40.635 Ecosystem Services	58	2.84
3.2.116 Rainbow Trout	34	1.67
6.10.502 Data Envelopment Analysis	27	1.32
6.3.385 Corporate Social Responsibility	26	1.27
6.223.972 Place attachment	25	1.22
3.51.208 Broiler	24	1.18
1.44.1198 Food Insecurity	23	1.13

Source: Web of Science

Table 6. Index Distribution of Publishing

Index	Number of documents	Percentage (%)
Science Citation Index Expanded (SCI-EXPANDED)	1486	72,81
Social Sciences Citation Index (SSCI)	852	41,74
Emerging Sources Citation Index (ESCI)	185	9,06
Conference Proceedings Citation Index – Science (CPCI-S)	144	7,06
Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH)	65	3,18
Book Citation Index – Science (BKCI-S)	38	1,86
Book Citation Index – Social Sciences & Humanities (BKCI-SSH)	27	1,32
Arts and Humanities Citation Index (A&HCI)	2	0,10

Source: Web of Science

is 651. The number of studies conducted in the United States comes in second place, with 403. Studies conducted in China constitute 31.90% of the total studies. This rate is 19.75% in the United States. England comes in third place. After England, there are India, Pakistan, and Australia. The last two countries are Germany and Spain. The number of studies in Germany is 74 and in Spain are 71.

Results regarding citations are of great importance in bibliometric analyzes as stated before, one of the main purposes of bibliometric analysis is to guide researchers who will conduct research on the subject and to direct them on

Table 7. Countries with the most broadcasts (top 10)

Country	Number of documents	Percentage (%)
China	651	31.90
United States	403	19.75
England	183	8.97
India	135	6.61
Pakistan	118	5.78
Australia	114	5.59
Italy	102	5.00
France	76	3.72
Germany	74	3.63
Spain	71	3.48

Source: Web of Science

which sources they should examine. Thus, the number of citations a study receives becomes an important criterion. It may be better to examine the most cited studies first. In Figure 3, the studies and citation numbers of studies on environmental quality, economic growth, and health are shown together. In the graph, the columns show the number of publications, and the lines show the number of citations. The trends in publication and citation numbers are generally similar. 2022 is the year with the highest number of publications and citations. After 2015, a significant increase has been seen in the number of citations. In 2015, Sustainable Development Goals were defined. As these targets increased environmental awareness, the literature on the subject increased rapidly in 2015 and beyond.

Another important element of bibliometric analysis is the manifest of the most cited studies on the subject. Thus, researchers who will start a new study can be more conscious about which sources they should examine first. Studies that have received many citations and have become one of the main sources in literature can be a guide for future studies.

Table 8 contains information on the top 10 most cited publications on the subject of "environmental quality, economic growth and health". Vos et al.'s study, published in 2015, ranks first with 3,513 citations. The average annual number of citations for this study is 390.33. The total number of citations of the study that ranks second is 2461. It is noteworthy that the difference between the total number of citations of the studies in the first and second row of the list is over a thousand. The total number of citations of the other studies in the list is under a thousand. In tenth place is a study titled "Environmental Health in China: Progress toward Clean Air and Safe Water" published in 2010. The

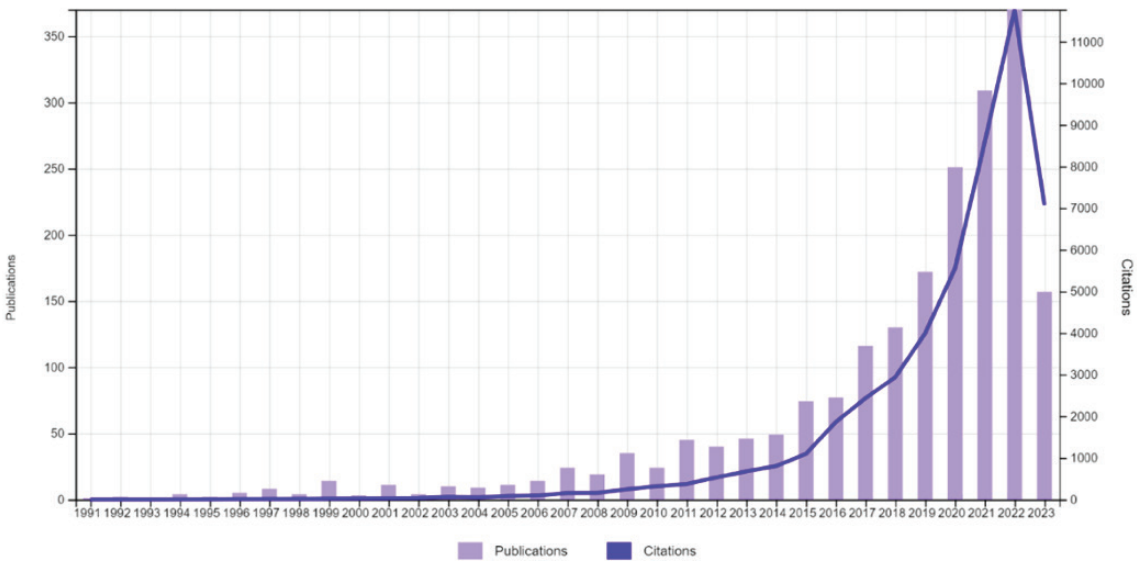

Figure 3. Number of publications and citations by years.

Source: Web of Science

Table 8. Article and author information by citation number (top 10)

Item Title	Authors	Publication Year	Total Citations	Average per year
Global, regional, and national incidence, prevalence, and years of disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013	Vos et al.	2015	3513	390.33
Global burden of 87 risk factors in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019	Murray et al.	2020	2461	615.25
Energy models for demand forecasting: A review	Suganthi, L and Samuel, AA	2012	724	60.33
Pediatric Obesity Assessment, Treatment, and Prevention: An Endocrine Society Clinical Practice Guideline	Styne et al.	2017	607	86.71
Cradle-to-cradle design: creating healthy emissions - a strategy for eco-effective product and system design	Braungart et al.	2007	479	28.18
City clusters in China: air and surface water pollution	Shao, M.; Tang, X.Y.; (...); Li, WJ	2006	472	26.22
A preliminary assessment of the impact of COVID-19 on environment? A case study of China	Wang, Q and Su, M	2020	462	115.5
Thermal plasma technology for the treatment of wastes: A critical review	Gomez et al.	2009	361	24.07
Nutrition and health of aquaculture fish	Oliva-Teles, A	2012	333	27.75
Environmental health in China: progress toward clean air and safe water	Zhang et al.	2010	324	23.14

Source: Web of Science

total number of citations in this study is 324, and the average number of citations per year is 23.14.

To date, the information obtained from the Web of Science database has been explained. Another important step in bibliometric analysis is the creation of visual maps. In the study, the VOS viewer program was used to prepare maps. VOS viewer was chosen because it is a frequently used program and is compatible with the Web of Science database. The operations were performed with VOS viewer 1.6.19 version.

First, a co-authorship analysis was performed. In the co-authorship category, three different units of analysis can be selected. These are the authors, countries and institutions. Figure 4 shows the co-authorship network map. The selected unit of analysis was the authors. This map contains information about authors who have published together and are linked. The minimum number of documents was determined to be two when creating the map. The total number of authors who have published on the subject is 8384, and the number of researchers who have at minimum 2 publications is 483. There are 2 authors who have the most publications. These authors are Ephraim Bonah Agyekum and Usman Mehmood. Both have eight publications. Khalid Zaman has 6 publications and Markus Amann has 5.

Another unit of analysis in the co-authorship is countries. Figure 5 shows the network map of the co-authorship analysis by country. The minimum number of documents and citations is 2. There are 134 countries that have published on the subject, and the number of countries with at least 2 publications and at least 2 citations is 100.

The minimum number of documents and citations is 2. There are 2960 organizations that have publications on the subject, and 798 of them have at least 2 publications and at least 2 citations. Chinese Academic Sci produced many articles in the co-authorship analysis by organizations, as shown in Figure 6. This organization has 58 publications on environmental quality, economic growth, and health, and the total number of citations of these publications is 1350. The second-ranked organization is Tsinghua University. 30 publications on the subject were made in this organization, and 1682 citations were received. Harvard University

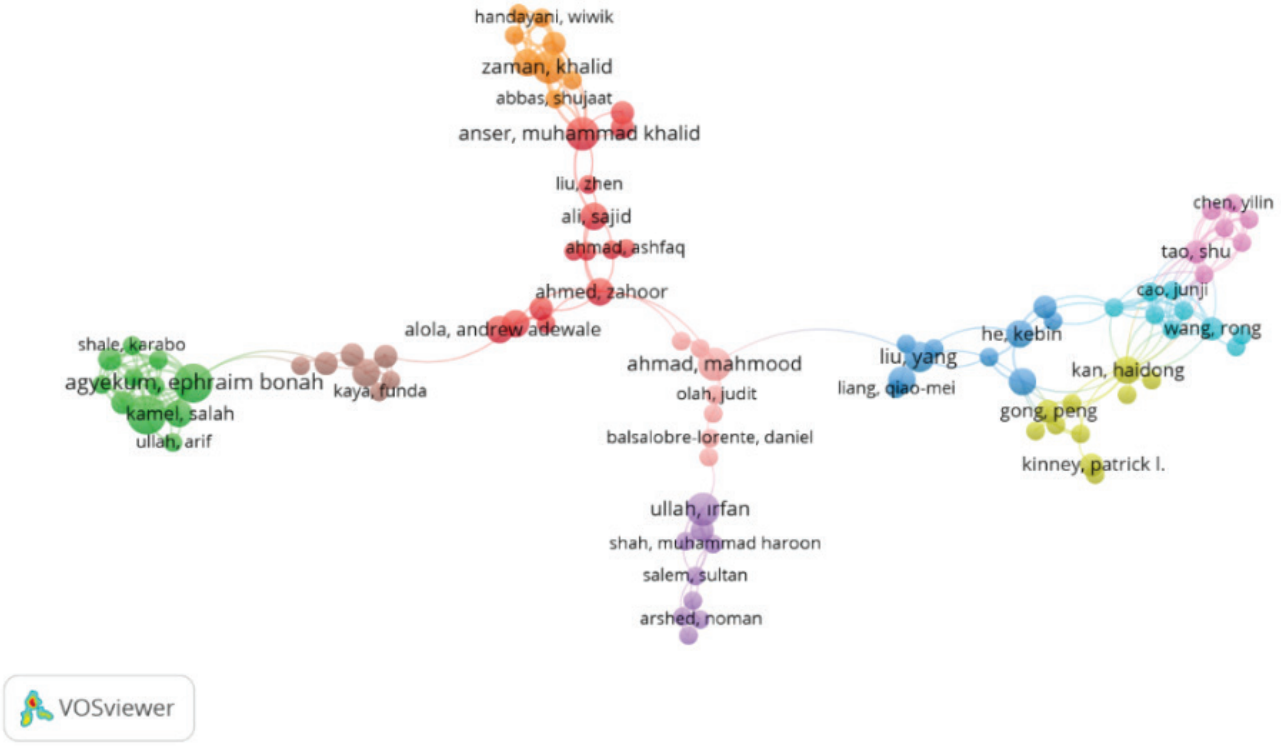

Figure 4. Co-authorship analysis (authors).

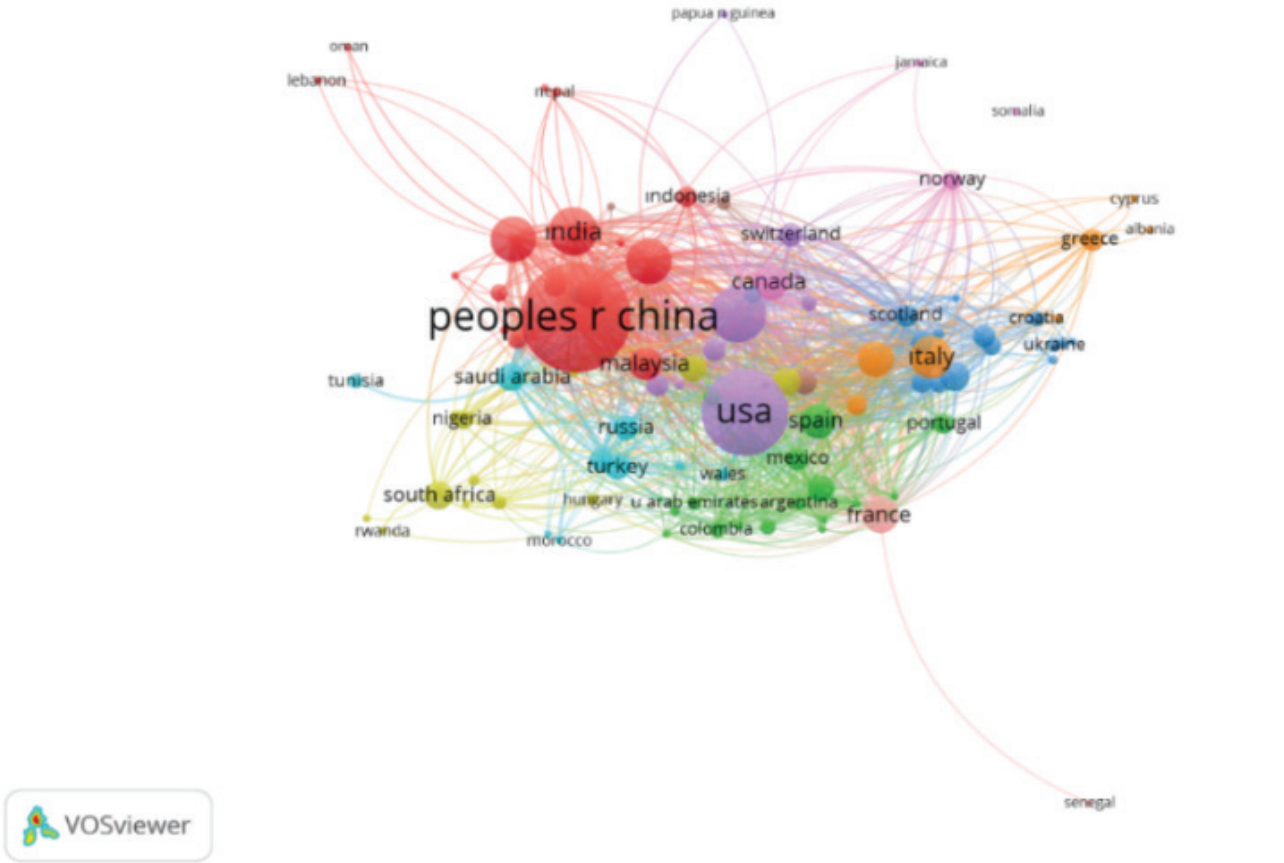

Figure 5. Co-authorship analysis (countries).

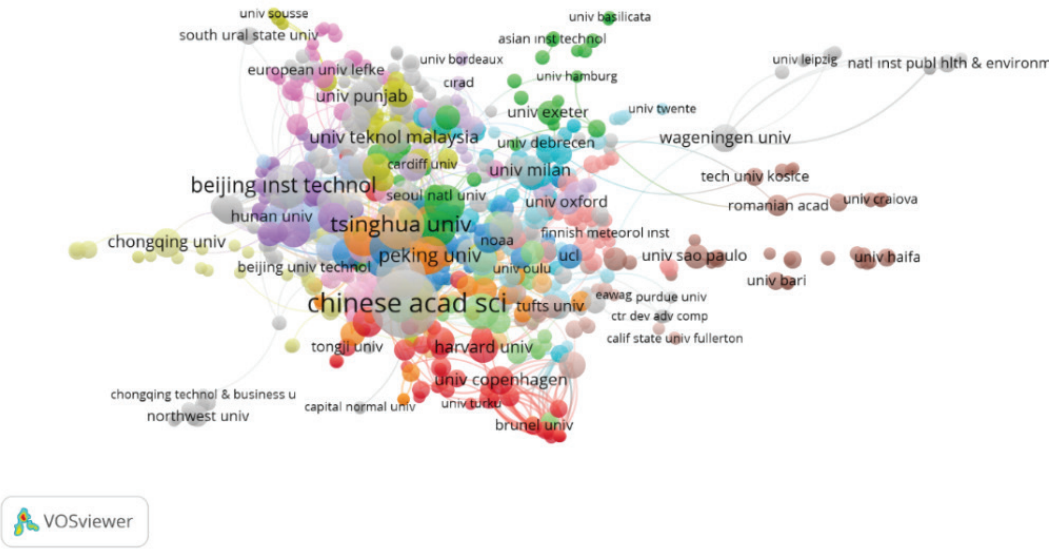

Figure 6. Co-authorship analysis (organizations).

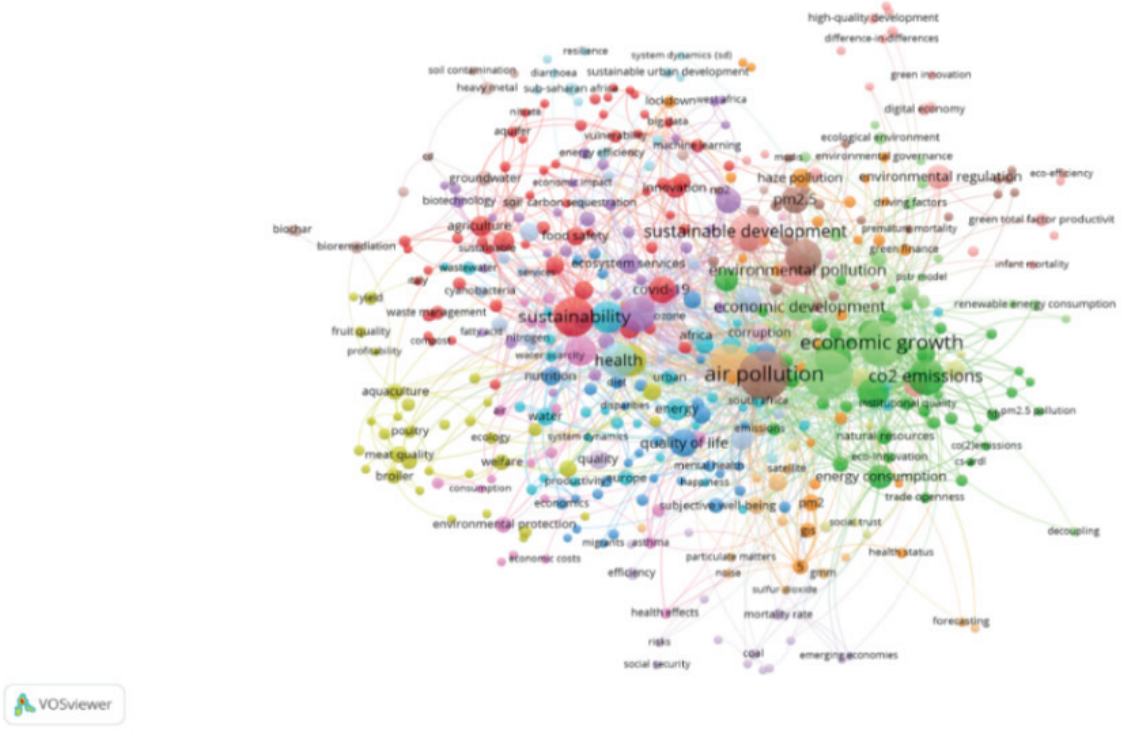

Figure 7. Co-occurrence (author keywords).

has 12 publications and 645 citations. Peking University also stands out, especially in terms of citation numbers. The number of publications related to the subject at this university is 18, and these publications have received 1344 citations.

Keywords and the frequency of their occurrence are another important indicator of bibliometric studies. Which keywords are used together and how frequently they are guiding researchers who will publish on this subject? The keyword most frequently used in studies on environmental quality, economic growth, and health is "Air Pollution". As seen in Figure 7, in addition to Air Pollution, the keywords China, Economic Growth, Health, CO2 Emissions, Environmental Quality, and Sustainable Development are frequently used. When creating the map, the minimum occurrence frequency of each keyword was determined to be 3. 459 of 5777 keywords were used at least 3 times.

Table 9. Study limitations

Limitation	Cause	Suggestions for future research
Scope of the tool	Information from the Web of Science database was used in this study. Maps were created using VOSviewer. VOSviewer was used because it is compatible with the Web of Science database.	Publications in different databases, such as Scopus, Google Scholar, and Wiley, can be scanned. Studies in these databases can also be added to the analysis.
Disciplinary differences	This study underlined publications in the field of economics. However, the "relationship between environmental quality, economic growth and health" is also a subject of research in disciplines other than economics.	Bibliometric analyses can be performed by examining studies from disciplines other than economics. The number of publications about environmental sciences, public environmental and occupational health is high. Bibliometric analyses focusing on these disciplines can be increased.
Rapid increase in the number of publications	The number of studies examining the relationship between environmental quality, economic growth, and health is increasing rapidly. For this reason, it is quite difficult to keep bibliometric analyses on the subject up to date.	The problem of timeliness can be overcome by ensuring the continuity and dissemination of bibliometric analyses on the topic.
The need for open access to data	The limited number of accessible publications makes it difficult to examine in detail the publications on the subject.	Bibliometric analyses can be performed that only include publicly accessible publications.

6. STUDY LIMITATIONS

In this study, publications on environmental quality, economic growth, and health were analyzed using the bibliometric analysis method. It is estimated that it will provide guidance for future studies on this subject. However, the study has some limitations. The limitations encountered during the analysis phase, the reasons for the limitations, and solution suggestions for future studies are listed in Table 9.

7. CONCLUSION

This study examined 2041 publications on "environmental quality, economic growth, and health" from 1991 to 2023. The bibliometric analysis method was applied using the Web of Science database and the VOS viewer program.

We had a search about environmental quality and economic growth nexus has a non-negligible interaction with health because of the increase in the number of studies related with this triple interaction. Although the number of publications on this subject has increased, there is no current study analyzing the publications in depth. There are some bibliometric analyses regarding this subject. However, no bibliometric analysis covering studies published in 2022 and 2023 could be found. The year in which the number of studies on the subject is highest is 2022. The number of studies published in the first half of 2023 has already exceeded 150. This is one of the two fundamental contributions of this study to the literature: to provide guidance for future studies by performing a comprehensive bibliometric analysis, including the most current publications. In other words, this study aims to address the gap in bibliometric analyses of environmental quality, economic growth, and health. The second fundamental addings of the study to the literature is related to research areas. Although the relationship between environmental quality, economic growth, and health is a common subject of different research fields, the economic consequences of the relationship in question are essential. Therefore, studies in the 6.10 Economics category were examined in detail according to the Citation Topics Meso criterion by filtering. The main hypothesis of the study is that "there is a need for studies examining the economic causes and consequences of environmental quality, economic growth, and health to become widespread nexus" For the studies to be widespread, previous studies on this subject should be searched and necessary gaps should be identified. This study also contributes to the identification of gaps in economic literature with the information it provides.

7.1. Theoretical Implications

This study aims to address the gap in bibliometric analyses of environmental quality, economic growth, and health. Although environmentally insensitive production processes increase economic growth, they also harm the environment. Increased environmental pollution causes deterioration in human health. To correct the deterioration in health, it is necessary to increase both individual and public health expenditures. This may damage budget balances and disrupt the health system.

The quality of governance and institutional quality does not depend only on economic indicators. Indicators of health and environmental quality also affect the institutional structure. Therefore, the institutional structure of countries can be strengthened by focusing on protecting the environment and improving public health. In addition,

economic, environmental, and health indicators should be considered together when measuring the level of welfare.

Most of the studies published in economics on environmental quality, economic growth, and health have carried out regional analyses. There are many studies, especially on the Chinese example. China is a country with a high rate of economic growth. China's emissions of carbon dioxide are also very high. As one of the countries that are effective in the deterioration of environmental quality, it is seen that studies on environmental quality, economic growth and health are mostly examined in the context of China. Factor efficiencies, economic and environmental indicators, and health indicators may differ according to provinces and regions. Therefore, each province or region should develop policies suitable for its own conditions. Implementing the same policies in every region of a country may not always produce the same results. Regions and provinces should apply differentiated policies.

7.2. Practical Implications

The first study on this topic was published in 1991. While the number of studies increased in the following years, it remained below 100 during the 1991–2016 period. There was a deep increase in the number of studies, especially in 2017 and afterward. It appears that most studies were published in 2021 and 2022.The number of studies in these two years is over 300. In the distribution of studies according to document type, articles take the first place. More than 80% of the studies are articles. According to the Web of Science categories, environmental sciences are in the first place. Approximately 98% of the studies are published in English. In terms of index distribution, SCI-Expanded ranks first, followed by SSCI.In the index distributions of the studies, SCI-Expanded comes first and SSCI comes second. The share of SCI-expanded indexed studies among the total studies is more than 72%. The top three countries that publish the most on the subject are China, the United States, and the United Kingdom.

An analysis of citations reveals a concurrent increase in both publications and citations. The number of citations remained stable between 1991 and 2006 but showed an increasing trend after 2006. This increase was more evident in 2015 and thereafter. The most cited study, conducted by T. Vos et al., was published in 2015. This study has been cited over three thousand times.

Following the analysis of data from the Web of Science database, visual maps were generated using the VOS viewer program. Maps of the co-authorship analysis and the most frequently used keywords have been shared. In the co-authorship analysis, when we look at the map of authors who have published together, we see that there is no grouping at a certain point, but many groupings at different points. The co-authorship analysis by organizations reveals strong connections. For instance, the collaboration between the Chinese Academy of Sciences and Tsinghua University stands out. The keywords most frequently used in studies on the subject are air pollution, sustainability, economic growth, CO2 emissions, and health. Numerous regional studies have been conducted. There are many regional studies. Studies conducted by provinces and states indicate regional differences.

Author's Contribution: The authors contributed to the study equally.

Conflicts of Interest: The authors declare that there is no conflict of interest.

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APPENDIX

Table A1. Studies on the Relationship between Environmental Quality, Economic Growth, and Health (6.10. Economics)

Authors (Pub. Year)	Years	Countries	Method	Results
Holmberg et al. (2009)	2002	191 countries	Regression Analysis	The quality of governance affects policies on social welfare, public health, and environmental sustainability. However, there is no single policy valid for every country.
Reinhardt et al. (2013)	2004–2007	11 European countries	Principal component analysis/Poisson regression	Being in a low socioeconomic position and working in a stressful work environment significantly affect functionality in older individuals.
Zhai YY, Ge H (2015)	2010–2013	China	Panel data regression	Low air pollution increases health efficiency and contributes to improving health investments.
Charron et al. (2015)	2013	206 different regions in 24 European Countries	Factor analysis	The quality of governance does not depend only on economic development; it is in close interaction with different fields such as social development, environmental quality, and quality of life.
Risse, V. (2015)	-	-	Comparative analysis	Welfare indicators should not be based solely on gross domestic product. New welfare indicators should also include elements such as health, social inclusion, and environmental quality.
Datta et al. (2017)	2001-2011	India	Regression Analysis	It has been stated that the program called MGNREGS is unsuccessful enough to increase food production. This triggers conflicts between rural and urban areas. This problem can be overcome by developing infrastructural factors.
Ben Amor, R.; de Miguel Gomez, M. D. (2018)	-	Spain	Comparative analysis	It has been determined that North African and Near Eastern countries have high competitive power in orange production. However, the fact that Spain is the key exporter of EU countries in the orange sector is an important factor that increases its competitiveness.
Popescu et al. (2018)	2000–2017	Romania	Multiple-indicator, multiple-cause model (MIMIC)	The main factors behind the high level of informal economy in Romania are high levels of tax avoidance, lack of trust in public officials, inadequate legislation, lack of government support for entrepreneurs, and increased bribery and corruption.
Mahdi Ghodsi, M. (2018)	1995–2011	EU countries	Fixed-effect Poisson estimation and Poisson GMM	The key factors that determine technical limits to trade and specific commercial concerns are efforts to improve environmental quality, protect human health, improve market efficiency, and protect domestic industry.
De Maya Matallana et al. (2018)	2001–2011	Spain (Murcia region)	P2 Pena Trapero distance methodology	The welfare levels of the counties in the Murcia region are not homogeneous. Differences in the welfare levels of the districts should be considered when creating economic policies.
Khan et al. (2019)	2007-2013	Bolivia	Non-linear pro-poor growth formulation	The negative effects of environmental factors and energy resources on the quality of life of the poor are greater than those who are not poor.
Noja et al. (2019)	1995–2017	EU countries	Robust regression, structural equ. model, Gaussian graphical models.	Government expenditures and environmental support policies lead to poverty reduction and per capita income increases in EU economies.
Majerova, I. (2019)	2004–2013	Visegrad Group Plus countries	Generalized Method of Moments (GMM)	Changes in household incomes and the amount of cars owned is the variables that have the greatest positive impact on healthcare personnel.

Rodríguez-Pose, A.; Tselios, V. (2019)	2002–2014	36 European countries	Least squares method	In decentralized countries where the quality of governance is low, general satisfaction with the economy, education, life satisfaction, and democracy tends to increase, whereas satisfaction with health may not always increase.
Nafngiyana, U.; Rahayu, S. P. (2019)	2008–2015	ASEAN countries	GMM	An increase in per capita income indirectly increases CO2 emissions through health expenditures.
Fotourehchi, Z.; Ebrahimpour, H. (2019)	1995–2017	Developing countries	Panel Data	The impact of health indicators on economic growth is quite high. Increasing human capital and decreasing environmental capital have positive impacts on economic growth.
Du et al. (2019)	2009–2016	China	Data Envelopment Analysis	There are imbalances between regions in terms of green innovation productivity. The productivity of the northeastern region is the lowest, whereas the productivity of the eastern and western regions is higher than that of the central regions.
Zhu et al. (2019)	2009–2016	Western Taiwan Straits Economic Zone	Data Envelopment Analysis	Economic growth, market openness, population density, and industrial structure positively impact eco-efficiency. The effects of energy intensity and science and technology expenditures on eco-efficiency are negative.
Ru et al. (2020)	2000–2016	China	GlobalMalmquist-Luenberger index	The quality of economic growth decreases as we move from east to west and from the center to distant regions in the country. Increasing environmental quality contributes to improving economic growth in terms of quantity, quality, and efficiency.
Huang et al. (2020)	2000–2017	China and India	Comparative analysis	The development model based on growth in the service sector is environmentally friendly and attaches importance to resource efficiency. Although this model causes balanced urbanization, it does not guarantee adequate employment and price stability.
Li et al. (2020)	2013-2016	China (31 provinces)	Dynamic data envelopment analysis	There are large differences in the total productivity values between cities.
Zhao et al. (2020)	2002–2016	China	Theil index and spatial distribution map	Although the general health level in China is increasing, the local health level is worsening. There is also an imbalance in the spatial distribution of health levels.
Pilipuk et al. (2020)	-	Belarus	Theoretical review	There is resource potential for agricultural production in the country, but resource efficiency needs to be increased.
Kim, Y.; Park, M. J.; Atukeren, E. (2020)	2002–2016	34 developing countries in Asia	Dynamic data envelopment analysis	The investment and management environment in the country affects the productivity of investments in the healthcare sector.
Ivankova et al. (2020)	2012-2016	OECD	Statistical descriptive analysis	Increasing the proportion of health expenditures in GDP increases the efficiency of health services. A well-functioning management system is of great importance in the financing of the healthcare system.
Ren et al. (2020)	2003–2016	China	Geographically weighted regression model	China's eco-efficiency is generally low. There are differences between the regions, with eco-efficiency being the highest in the eastern region.
Hu et al. (2020)	2003–2018	China (107 provinces)	Hyperbolic distance function (HDF) model	Cities with high resource dependence have low energy and environmental efficiencies. In terms of regional classification, cities in the eastern regions have higher energy and environmental efficiency, whereas cities in the central and western regions have lower efficiency.

Schaefer, A. (2020)	-	-	Theoretical review	Environmental pollution reduces the survival probability of children. Economic conditions play an important role in children's exposure to environmental pollution. Because families with high incomes prefer to live in clean areas with low environmental pollution.
Graafland, J. (2020)	2011–2017	35 OECD members + Brazil + Russia + South Africa	Multiple regression analysis	Cultural variables are also effective in determining differences in welfare levels among countries. The interplay between culture and institutions must be considered when explaining differences in welfare levels.
Sharif, F.; Tauqir, A. (2021)	1972–2017	Pakistan	Fully modified ordinary least square (FMOLS) and dynamic ordinary least square (DOLS)	It has been concluded that there is a road infrastructure and economic growth nexus. The decrease in environmental quality due to the increase in carbon emissions adversely affects economic growth.
He, L. Y.; Qi, X. F. (2021)	2000–2008	China	Regression Analysis	Low efficiency of resource allocation adversely affects environmental quality. The development approach, which only considers the speed of economic growth, exacerbates the inefficiency in resource allocation.
Yang et al. (2021)	2012–2017	China	Least squares method	Social trust has a positive effect on green technology. In addition, when policy uncertainty is high and intellectual property rights are not adequately protected, the effect of social trust on green technology innovation is more pronounced.
Majeed et al. (2021)	1990–2019	Pakistan	ARDL and NARDL	Economic freedom has no impact on economic growth and air pollution. Economic freedom reduces air pollution eventually.
Hao et al. (2021)	2002–2012	China (23 states)	Panel Data	Increases in income inequality and fiscal decentralization adversely affect public health.
Mugambi et al. (2021)	2014-2020	Spain	Data Envelopment Analysis	Efficiency in the use of renewable energy resources in Spain shows inequality between regions. It was determined that these differences continued throughout the period examined.
Shi et al. (2021)	2014–2017	China (30 provinces)	Dynamic data envelopment analysis	The productivity differences between provinces are enormous. The main reasons for this difference are resource equipment, industrial structure, geographical environment, and strategic adaptation.
Li et al. (2021)	2013-2016	China (31 provinces)	Dynamic data envelopment analysis	It is necessary to provide more coverage of the issue of environmental pollution in the media. Media news about environmental pollution improves public health and supports economic growth by creating environmental awareness.
Nchofoung et al. (2021)	1996–2019	107 developing countries	Tobit regression	In developing countries, natural resource rents have a direct and positive effect on human development. The main factors that create differences are income level, regional groupings, export structure, and development level.
Li, S.; Shen, H. (2022)	1987–2017	Selected 124 countries	GMM	Economic growth creates improvements in health standards. Deterioration of environmental quality negatively affects health standards.
Xu et al. (2022)	2006–2019	China (99 mining cities)	Data envelopment analysis method and common frontier model	Mining cities demonstrate heterogeneity in factor allocation efficiency. Cities also vary in their convergence speeds.
Guo et al. (2022)	1991–2019	China	Data envelopment analysis	The control of urban and industrial pollution control was low during the study period. There is economic development, and the efficiency nexus of urban and industrial pollution control is U-shaped.

Nguyen et al. (2022)	-	Selected 87 countries	GMM	The use of the Internet and mobile applications positively affects corporate quality. However, the effect of CO2 emissions on institutional quality is negative.
Zhang et al. (2022)	2000–2020	Hainan Island	EBM model	It has been determined that there is a relationship between the development of the tourism sector and environmental protection. More attention should be paid to technological innovations and management reforms to increase the efficiency of the tourism sector.
Liu, Y.; Hao, Y.; Lu, Z. N. (2022b)	2015-2017	China (29 provinces)	Linear-regression models	There is an important connection between health shocks, health insurance, and household financial decisions. The negative effects of health shocks are greater in households with low incomes. Households with health insurance have bigger tendency to invest in risky financial assets.
Atisa, G.; Racelis, A. E. (2022)	-	Rio Grande Valley, South Texas	Qualitative analysis	The potential exists to build regional resilience to climate change, but this potential is not reflected in current policies. It has been stated that the opportunities offered by urbanization cannot be taken advantage of and that climate change negatively affects the resilience of society.
Liu et al (2022a)	1990–2018	E7 countries	Cross-sectional autoregressive distributed lag (CS-ARDL) technique	Financial development decreases ecological quality, whereas human capital and institutional quality increase ecological quality.
Cao, L.; Niu, H. (2022)	2001–2020	China (30 provinces)	Panel Data	Green credits have a significant effect on improving total factor carbon emission performance. In addition, the relationship between green credits and total factor emission performance is in an inverted U shape.
Huang et al. (2022)	2001–2017	China (30 states)	Undesirable output-oriented SBM–DEA and GML models	The provinces are divided into three groups: eastern, western, and central. There are significant differences in the green total factor productivity of these regions. Environmental regulations are extremely important for improving factor productivity.
Ma et al. (2022)	2003–2018	China (Yangtze River Economic Belt)	Super-EBM model	There is spatial and temporal heterogeneity. Economic growth, energy structure, and human capital increase green total factor energy efficiency.
Davidescu et al. (2022)	2008–2019	10 EU member states in Central and Eastern Europe	Panel Data	High technology exports, minimum wage practices, institutional quality, education expenditures, and the degree of economic openness reduce income inequality. To improve the quality of life, it is necessary to reduce income inequality.
Zhu, J. H.; Wang, S. S. (2022)	2005–2016	China	Super-SBM model and Malmquist index model	The static and dynamic productivity of resource-based cities in western China were measured. It was determined that the static productivity of the cities evaluated was low and that development was not realized balanced. Dynamic productivity, however, showed an increasing trend.
Ma et al. (2022)	2014-2018	China	Fixed effect ordered logit model regression analysis	Overeducation negatively affects employees' job satisfaction. Wage income plays an important of overeducation and job satisfaction nexus.
Zhao et al. (2022)	2014-2020	China (30 states)	Model of geographically and temporally weighted regression	Digitalization has a great impact on total green factor productivity. However, this effect is decreasing. There are significant differences between the regions.
Yao et al. (2022)	2006–2020	Yangtze River Economic Belt (110 cities)	Super-SBM model	It has been observed that the efficiency of industrial green technology innovation increases slowly at first, then decreases, and then increases. It was concluded that an N-type trend was observed in efficiency.

Zhou et al. (2022)	2020	China (18 free trade zones)	Fuzzy set a qualitative comparative analysis method	The development of free trade zones does not depend on a single factor but is the result of different elements combining. In particular, foreign investments, the green production growth rate, and green policy effectiveness are extremely important.
Ullah et al. (2022)	2006–2019	64 Belt and Road Initiative (BRI) countries	GMM	Financial development, financial inclusion, energy efficiency rate, per capita income increase rate, and per capita health expenditures positively affect sustainable development.
Dong et al. (2022)	2000–2015	Yangtze River economic belt	Quantile regression model/ geographically weighted regression model	During the period examined, average economic productivity increased, whereas the industrial transformation rate decreased. Additionally, the impact of the scope.
Leonidova, G.V. (2022)	2018–2020	Russia	Survey	Integration of social innovations into working life and implementation of health protection programs are the main factors effective in increasing the satisfaction level of employees.
Ren, W.; Chen, Y. (2022)	2006–2018	China	Malmquist–Luenberger (M-L) index	The total green factor efficiency of China's maritime economy has increased over time. Technological innovations have a positive. The effects of environmental regulations vary depending on their intensity.
Kumari et al. (2023)	2019–2021	India (29 states)	Principal component analysis (PCA)	Regional heterogeneity exists in India. The states in the Central and Eastern regions are less developed, and most population lives in these regions.
Ecevit et al. (2023)	2000–2018	Emerging economies	Panel Data	Population aging, economic growth, and an increase in greenhouse gas emissions increase healthcare expenditures. Globalization has decreasing effects on health expenditures.
Afrin, S.; Shammi, M. (2023)	2020	Bangladesh	Drivers–Pressures–States–Impact–Response (DPSIR) framework	Measures taken because of the COVID-19 pandemic have confined women to more homes and increased gender-based vulnerabilities. The epidemic process has also negatively affected women in education, employment, domestic violence, and health.
Nguyen et al. (2023)	2011–2019	130 selected countries	Panel quantile regression analyzes	Climate risk has significant and complex implications for the sustainable development of the financial sector.
Pan et al. (2023)	2000–2015	Tibet	Structural equation modeling (SEM)	Migration has direct negative and indirect positive impacts on the overall sustainable development score.
Fang et al. (2023)	2006–2019	China (11 cities in Zhejiang)	Panel Data	The digital economy, technological innovation, and pollution control levels have a positive impact on environmental efficiency. However, the share of industrial production in gross domestic product negatively affects environmental efficiency.
Gooch, E.; Martinez-Vazquez, J.; Yedgenov, B. (2023)	1900–2000	Colonized and Not Colonized by Western European Countries	Regression analysis and causality analysis	A statistically significant relationship exists between malaria prevalence and institutional quality. Additionally, an increase in institutional quality increases economic growth.
Xu et al. (2023)	2019–2021	China	Face-to-face survey	The main constraints of the green development strategy are economic backwardness at the local level and low industrial earning rates.