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THE TOTAL COST OF NATURAL RESOURCES, DEPLETION OF NATURAL RESOURCES, ALTERNATIVE ENERGY, AGRICULTURAL RAW MATERIALS, AND CO2 EMISSIONS

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ABSTRACT

Mineral resources are essential to our everyday lives, but are finite and can be depleted if not managed responsibly. Unfortunately, many natural resources have been exploited and depleted due to unsustainable mining practices and over-consumption. In order to alleviate such problems to achieve long-term sustainability, the importance of an equal distribution of resource rents, responsible management, and an ecologically friendly extraction approach should be applied. The paper presents the interaction between the segmentation of resources and the discharge of carbon dioxide in China since 1971 and 2020, where the moderating attribute is the consumption of alternative energy resources, importation of agricultural raw materials, and exports of goods and services. The various economic motives that are influential in the country are the total natural resource rents, dependence on other forms of energy, imports of raw material, natural resource depletion, trends in international trade, and general environmental degradation. This is because the outcomes of the results reflected unfavorable correlations of rents on natural resources, the adoption of alternative energy, agricultural imports, and emissions, which indicates that the enhancement of these regions would contribute greatly to the diminishing carbon emissions. On the other hand, the identified positive linkages between the depletion of resources, trade practices, and carbon emission reflect the fact that Warren-wide and combined policy actions are necessary to support sustainable development trajectories within China.

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INTRODUCTION

Rents associated with natural resources and their depletion exert significant impacts on both economies and the environment (Lieberei and Gheewala, 2017). As resources become scarce, rising rents and declining availability can contribute to poverty and deteriorating living standards. Resource exhaustion drives up costs, reducing purchasing power and exacerbating socioeconomic inequality. Wealth distribution is also lopsided when gentrification is experienced, given that there is an escalation of rents (Xu and Zhao, 2023). Moreover, an increase in rent may easily lead to loss of affordable housing, urban sprawl, and destruction of forests. Besides the drain of natural resources, rent can affect society and the environment to a great extent. It can lead to increased inequality, reduction of biodiversity, and pollution (Lin et al., 2018).

There are a number of determinants of the CO2 emissions, one of which is the natural resource rents and depletion. When minerals, oil, and gas have been removed from the earth, they cannot be recovered. This makes it more expensive to extract them, thus influencing the energy prices as the availability declines. Subsequently, there is an impact on CO2 releases based on energy production. Besides harvesting natural resources, you are earning rent, which is the income you get out of harvesting those natural resources, like oil fields. This may also lead to an increase in CO2 emissions because the output of other types of alternative energy sources may create more greenhouse gas emissions than fossil fuels (Ali et al., 2021).

The issue of the depletion of natural resources is not typical of China only. It can be disastrous, such as air and water pollution, which could be a consequence of the unfair mechanism of the extraction of natural resources. The effects of climate change are extremely wide-ranging as it pollutes the air and water, impairs soil, and deteriorates biodiversity. These issues have been compounded by the swift decline of the natural resources in the case of China, where it has been a major contributor to poorer air and water quality (Yi et al., 2023). Since it is the result of fossil fuels, natural resources are being exhausted over the years, causing the pollution of water and air. Moreover, the use of fossil fuels also causes warming of the global environment through the emission of greenhouse gases. There is a depletion of natural resources in China, leading to soil degradation. The use of resources will lead to soil erosion and desertification, which may automatically lead to depleted production of agricultural produce, thus leading to poor crop yield and quality of food. Utilization of natural resources and loss of biodiversity are among the issues that affect the well-being of an ecosystem (Nawaz et al., 2019).

One of the initial significant questions which are discussed in this study is the depletion of natural resources, as well as the emission of carbon dioxide. It is also necessary to mention that China is the second country which emits carbon dioxide as soon as possible, so this question is rather topical. Considering that global climate change is partly attributable to the depletion of natural resources, it is important to determine how it is affecting China in regard to its CO2 emissions (Rinkesh, 2020). Natural resources are

expensive to China, even though they are of significance. With a limited number of resources, the resources become more in demand and cause more emissions (United Nations, 2018). The energy sector has not been spared, as the natural resources have been depleted in China. The emergence of alternative sources of energy (including renewable), the scarcer a resource is. The deforestation that happens leads to an increase in the emission of CO2 since the resources decrease. As well as the quality of air and water, the condition of human health is the result of deforestation (Rahim et al., 2021).

Two extremely significant questions are answered in this respect in the study. The initial question may be utilized to determine how the natural resource rents influence the CO2 emissions of the country. Natural resource rent also has a significant effect on the emission of CO2 in China. Natural resources such as fossil fuels form the largest power source for the Chinese economy (Haseeb et al., 2021). There are increased fuel costs due to the application of increased demand on oil and gas, and rent has become a more profitable business (Jiang et al., 2022). The increase in oil and gas infrastructure has also been mentioned as a cause of the subsequent growth of emissions. This can be accomplished by using alternative energy sources and reducing natural resources in China, thus limiting the emissions (Ali et al., 2021).

Also, the paper addresses the effect of renewable energy sources on CO2 emissions in China. The interest in the impact of various energy sources on emissions has increased over the past years, and this is due to growing knowledge of climate change. The existing patterns indicate that the emergence of renewable resources may help China to cut the amount of carbon dioxide emissions by 30 percent by 2030. This state of affairs would be bettered by taking even more bold steps to popularize renewable energy and minimize fossil fuel output (Sadorsky, 2009).

The study also looks at the impact that CO2 emissions have in China because of agricultural raw materials imports. Importation of food, fiber, and fuel contributes to greenhouse gas emissions in China in significant proportions. Agricultural raw materials can still be imported, and that would mean high emissions of CO2. Importation of agricultural and raw materials contributes largely to CO2 emissions in China, considering the fact that transportation of such goods, especially in other nations to China, contributes immensely to greenhouse gases; therefore, an increase in the latter is observed. One of the biggest producers of CO2 is soybeans and corn brought in from Central and South America to be used as animal feed, and so on.

The process of transporting meat makes the importation of meat, like that of Brazil to China, environmentally costly because of the huge production of carbon dioxide. Wheat and rice also grow as agricultural materials, bringing CO2 to the environment (Kislev, 2013).

Theoretical Review of Literature

In recent years, close attention has been paid to the correlation between depletion of natural resources, environmental and economic factors, and energy usage. These relationships have been empirically examined by a variety of research studies that aimed to get a better grasp of the impact that any of these elements could have upon the others (Bai and Liu, 2023; Huang et al., 2023; Khan et al., 2021; Liu and Chen, 2022; Nathaniel et al., 2021; Shinwari et al., 2022; Sun et al., 2022; Xu et al., 2022). According to some studies, the depletion of natural resources directly increases the environmental and economic factors and the use of energy (Azam et al., 2022). Furthermore, one has learned that, on its part, the consumption of natural resources and supplies of energy can be affected by environmental and economic factors (Huang et al., 2020).

The losses of natural resources and rent that are connected with it have already been characterized by a significant increase in the twentieth century. This depletion, with an increase in the release of CO2, which creates the current climate change conditions, has also been attributed to this depletion. That increased cost would lead to higher release, both of the extraction and presentation of the resource, as well as the increased energy costs required to produce it (Zhang et al., 2021). In Yi et al. (2023), depleting her natural resources might further lead to state-level economic consequences such as the additional rent ensured by the CO2 periodicity (2023). The consequences of climate change on human well-being and the availability of resources are very extensive. It is shown that it can also hinder the availability of water, food, and expose the population to dangerous weather conditions as well. These impacts include biodiversity, water and air quality, and climate change impacts.

The use of remaining sources of energy is of massive importance in alleviating carbon dioxide emissions. Greenhouse gas emissions can be greatly reduced when nations switch to renewable and nuclear energy sources, which will mitigate the negative effects of climate change (Azam et al., 2022; Bilal et al., 2022; Khan et al., 2022; Söderholm, 2020; Oh et al., 2018; Pardo Martínez, 2011). Renewable and nuclear energy are comparatively cheaper and provide long-duration power to the system as opposed to some of the traditional fossil fuels. Most efficient, they are also likely to give fuller energy output with fewer inputs, which subsequently produces reduced emissions (Müller et al., 2020; Shahbaz et al., 2015; Bento and Moutinho, 2016; Topcu and Tugcu, 2019; Smolovic et al., 2020).

Simultaneously, the fast dwindling of natural resources like fossil fuels and minerals at an unsustainable rate of exploitation is contributing to scarcity, price increases, and serious environmental degradation. All these forces need a coherent approach, merging the impact of sustainable practices, conservation measures, and innovative technologies to mechanize the reduction in resource consumption and ensure long-term sustainability of the planet (Mukhtarov et al., 2020). Studies are also limited to the area of importation of farm raw material and the emission of CO2. It constitutes a dangerous literature lag due to the fact that the two areas of interest meet the agricultural sector and the environment (Anderson et al., 2014). According to the most recent publications, the relationship between bringing into the country the raw material used in agriculture and the emissions of CO2 has been underlined to make a wise decision about the whole industry (Kislev, 2013). According to Anderson et al. (2014), the problems in the context of the importation of agricultural raw materials and their connection to carbon dioxide emissions in Latin America are critical. They found at least some evidence that the imported level of agricultural raw materials was heavily related to national levels of CO 2 emissions. Such an association emphasizes the necessity of including agricultural trade aspects into the policies that should achieve the intended reduction in emissions and sustainable development (Wang et al., 2023).

Besides environmental aspects, the literature also dwells upon the promoting features of the import of agricultural raw materials to formulate global food security (Eyuboglu and Uzar, 2020; Levels, 1995; Norton, 2014). In a similar fashion, Chandio et al. (2018) have reported that imported dynamic matters are at the heart of effective policy development that guarantees food security and enhances resiliencies in emerging economies (Gitz et al., 2016; Ikram et al., 2020; Yu and Wu, 2018).

METHODOLOGY

Theoretic Framework

What cannot be ascertained is the extent to which the connection exists, but people are in unison that these two phenomena are interrelated. The misuse of natural resources results in more emissions because to produce and consume more items, more energy and other materials are exploited. Due to depletion of natural resources by way of deforestation, burning of fossil fuels, and other activities that lead to emissions, the depletion of natural resources may also lead to an increase in emissions. The adoption of sustainable behavior and advocacy on renewable sources of energy is essential in enabling industries and governments to scale down the effects of the depletion of resources on emissions. We can transform our future towards being more eco-friendly and environmentally sustainable by not using natural resources as much and changing our sources of energy to more pollution-free ones.

Depletion of resources and carbon dioxide emissions are related. Exhaustion of resources may lead to an increase in the quantity of pollutants emitted into the atmosphere and hence cause global warming. The mutual dependence of the two is very complicated and has several aspects, but there is no denial of the fact that there is some sort of relationship between the two. Resource depletion and the shift to renewable energy sources should also be mentioned as the basis to prevent the impacts of climate change and save our planet so that next generations can also live in it. This interrelation has huge environmental consequences, and we need to learn about this interrelation to save the planet.

In most nations, energy is mainly generated through the burning of natural resources like oil, gas, and coal, which raises carbon dioxide emissions. One of the major causes of the increase in emissions is the exploitation of natural resources by having it as an input for economic growth. Efforts to ensure that these problems are taken seriously will involve switching to renewable energy sources, enhancing energy efficiency, and commencing carbon capture and storage technologies. CO2 emissions have numerous environmental impacts that include sea level rise, warming of the Earth, and acidification of the ocean. To cut the emissions of CO2, nations all over the world have enforced numerous policies and rules in order to restrict their emissions. These involve: the Paris Climate Agreement, requiring the signatories to cut their emissions to a particular amount, and renewable energy projects, whereby renewable energy sources are used. The relationship between natural resources and CO2 emissions is also examined on the basis of technology, where the researchers aim to create technology that would help to reduce natural resource-generated emissions due to the burning of natural resources. Alternative energy sources may also be developed, increasing the efficiency of energy and air quality.

Data and Estimations

This study investigates how natural resource depletion and resource rents influence carbon dioxide emissions in China over the period 1971–2020.

$$LNCO2_t = \beta_0 + \beta_1 LNTOT_t + \beta_2 LNNRD_t + \beta_3 LNALT_t + \beta_4 LNARM_t + \beta_4 LNTRADE_t + \mu_t \quad (1)$$

In this study, carbon dioxide emissions (kt) (LNCO2) serve as the dependent variable. The independent variables include total natural resource rents (LNTOT, expressed as a percentage of GDP), natural resource depletion (LNNRD, expressed as a percentage of GNI), alternative and nuclear energy (LNALT, measured as a percentage of total energy use), agricultural raw material imports (LNARM, measured as a percentage of merchandise imports), and exports of goods and services (LNTRADE, expressed as a percentage of GDP) (WDI, 2022). CO2 emissions are one of the most pervasive and damaging forms of pollution worldwide. Unregulated, such emissions would have a far-reaching effect on the world's climatic conditions and ecosystems. The climate change question has obtained new acuity, and various governments are not concerned with the need to control the emission of carbon. The emission of carbon has a greenhouse effect, having increasing global temperature with a myriad of environmental effects. To address this challenge, the governments have conducted colossal efforts to ensure the reduction in the rates of CO2 emissions through the implementation of numerous orders and initiatives. These resources are either sold or used during the production process, and they offer economic value. Natural resources pay rents that have no relation to the market prices.

A second emerging challenge is the depletion of natural resources, which somewhat affects the environment, economy, and community. Switching to alternative sources of energy under considering the limited resources, is of utmost importance. With the implementation of sustainable practices and renewable energy sources, our environmental sustainability and our resilience as a community can be enhanced. Raw materials that were used in farming processes have also been subject to importation in different countries. Those imports could be utilized to stimulate local businesses such as the food industry, manufacturing, and animal feed industry. They can also be utilized to provide other sectors, such as cosmetics and pharmaceutical sectors, and other basic ingredients. They assist countries to specialize in various industries, leverage economies of scale, and international cooperation is boosted as well. The involvement in international trade enables countries to open the way to economic growth, employment, and sustainable development. Exports also promote growth in the economy, and this, in effect, can make wages high and people live better lives. Moreover, a new market can be revealed because of exports of goods and services, as well as job creation and international collaboration. They will also be able to result in better trade partnerships among nations.

Unit-Root with Break Test

This study employs the Zivot–Andrews (1992) unit root test with structural breaks to examine the time-series properties of the data. The test investigates the reliability of the parameter under consideration. When the underlying parameter is constant, it may be deduced that the data is in a unit root type process, and when the underlying parameter is shifting, then it has a structural break. The underlying parameter may be changing, which we would be able to identify with the help of the unit root break test. This test can be applied in other economic and monetary models, like the ones used in macroeconomic projections. Depending on the result of this test, a better decision-maker and more knowledgeable regarding the data will be possible. One of the powerful statistical tests in distinguishing unit roots in the time series data is the Zivot and Andrews test with breaks, wherein the other diagnostic tests, such as the ADF test, do not yield results. It is also desirable with regard to testing stationarity of time-series data because of its identification of breaks and the manner in which it addresses heteroscedasticity. Adding breaks to the analysis, and this is what makes the Zivot and Andrews (Zivot-Andrews, 1992) test helpful in rock rate and regression analysis of time series data.

Johansen Cointegration Test

Here, we shall demonstrate the cointegration of the data using the Johansen Cointegration Test (Johansen, 1991). Johansen Cointegration Test is a Potent Statistical Method in finding the Order of Integration and assigning a Long-run Equilibrium Association to a series of non-stationary series. The possibility to determine together with discovering cointegration vectors and also to check the stationarity of variables has made it an unavoidable factor in many areas, such as economics, finance, and econometrics. Through the multivariate time series, the Johansen Cointegration Test gives us a finer grasp of the dynamics inside any economic system and enables one to make decision-making processes that would be informed by this analysis (Kaufman, 1988).

Long-run Robust Least Squares Estimates

The proposed design of the study uses a dynamic-factor model (Stock and Watson, 2012) to study the dynamics of the economic system. Dynamic-factor model is a macroeconomic model that takes into consideration the fact that many economic variables are time-varying and the interaction of economic variables in terms of providing feedback. The model is built using a bunch of economic equations that define the relations among the variables. Such equations will then be assembled into a dynamic system of equations that represents the dynamics of the economic system. We shall utilize the information from many sources to approximate the parameters of the model and subsequently apply the model to the simulation of alternative events of the economic system (Stock and Watson, 2012). The outcome of the simulations will be used to determine how the economic system will respond to the changes in policies.

The Dynamic-factor model can be used as a powerful instrument of the economic macroeconomic behavior determination and prediction. Through the use of the equations above, the interactions of the different indicators of the economy can be noted, and also the effects of the fluctuation of one indicator on the other indicators of the economy. This knowledge may be used in crafting economic policy and influencing economic development.

The multiple regression methods, such as Robust ARCH family regression (Engle, 1982), have been used to analyze our data correctly as well as to forecast. A family of regression models is seen as a Robust ARCH, and is particularly employed when data is non-stationary and distributions of the errors are found to be heteroscedastic. The models that this type of regression is constructed on are autoregressive conditional heteroscedasticity (ARCH) models, and this family is an alternative to GARCH models. The Robust ARCH family regression has the advantage of being able to have different distributions and volatility schemes, so it can be an asset to what we need. It has proved to be more reliable as compared to other regression methods. Strong ARCH family regression also comes in handy with identifying outliers as well as minimizing issues that allude to multicollinearity.

RESULTS AND DISCUSSION

Table 1 shows an overview of the descriptive statistics of carbon dioxide emissions, total natural resources, depletion in natural resources, alternative energy sources, raw material imports of agricultural goods, and the international trade in terms of the mean, median, maximum, and inequality of the data. This indicates that the variability of these values is not strong and does not vary among the places and even times. This might be explained by numerous things, namely, the implementation of new policies, initiatives, and regulations that allow regulating emissions and motivate the utilization of alternative sources of energy in international trade. Also, the presence of economies of scale in international trade aids in lowering the production and transportation fees of goods and services. Natural resource depletion and CO2 emissions directly influence a number of variables. Due to the depletion of natural resources, the prices may fluctuate, and then economic stability becomes unstable, and the resources are also not available anymore. CO2 emissions are, however, relevant to the weather patterns, financial system, and stability of the climatic system. It is important to understand how these factors influence the management of resources and mitigation processes in attempting to deal with changes in climate.

Table 1. The summary statistics.

Variables	LN-CO2	LN-TOT	LN-NRD	LN-ALT	LN-ARM	LN-TRADE
Means	15.4263	0.142031	-0.411670	2.235270	0.430580	2.259403
Medians	15.4159	-0.010727	-0.493865	2.326699	0.502194	2.270370
Maximums	15.5692	1.721429	1.429963	2.596905	1.213794	2.605982
Minimums	15.2756	-1.449454	-3.095483	1.519485	-0.281897	1.687370
S.Ds	0.08711	0.692076	0.866374	0.293194	0.445341	0.221990
LN-CO2	1.00000					
LN-TOT	-0.4021	1.000000				
LN-NRD	-0.3748	0.979361	1.000000			
LN-ALT	0.56244	-0.567294	-0.577443	1.000000		
LN-ARM	-0.6540	0.602127	0.639985	-0.896698	1.000000	
LN-TRADE	0.56490	-0.397670	-0.467329	0.804179	-0.825491	1.000000

Table 2. The result of structure break unit-root.

	Level			1st-differences		
Methods/Variables	t-Statistic	Prob	Break Date	t-Statistic	Prob	Break Date
LN-CO2	-2.609	0.86	2016	-6.380***	< 0.01	2018
LN-TOT	-3.889	0.19	2015	-7.955***	< 0.01	2016
LN-NRD	-3.804	0.23	2015	-8.102***	< 0.01	2016
LN-ALT	-4.219	0.09	2016	-8.922***	< 0.01	2017
LN-ARM	-2.276	0.95	2000	-6.670***	< 0.01	2016
LN-TRADE	-4.230*	0.09	2011	-5.251***	< 0.01	2016

***and * shows significance at 1%and 10%.

Table 2 reports the results of unit root tests. As we are able to notice, there might be some non-stationarity in the differences between consecutive values, and this can consequently interfere with the results of our analysis. This is an aspect of consideration that we should take into account when analyzing, since it impacts the validity of our findings. Moreover, a different result would also be reached based on the time of analysis due to the non-stationarity of the variables at the first difference. These dates are linked to massive environmental changes in terms of economic, political, and social changes. As an example, 2016 was an election year in China, and the cause of that election resulted in a fundamental change in politics. In 2015 in the US, the economy was coming out of the Great Recession, and the stock market started an extensive bull market run. 2000 was the start of a new millennium and the onset of a new phase of technologically enhanced opportunities.

Table 3 shows the result of DBS Independence. A Decentralized Balance Sheet is known as DBS, and the test looks into the capability of a country to take care of its own demand through self-supply instead of indulging in imports. The DBS Independence Test is a measure of how self-reliant a nation is in the concerned matters. In terms of examining CO2 emissions, the DBS Independence Test will factor in the capacity of a particular country to pursue the reduction of carbon dioxide emissions and other greenhouse gases.

Table 3. The DBS-independence estimations.

Dimensions	BDS-Statistics	Stad. errors	z-statistics	Probs.
LN-CO2				
2	0.153293***	0.006865	22.32845	0.0000
3	0.256516***	0.011069	23.17527	0.0000
4	0.316814***	0.013366	23.70244	0.0000
5	0.347517***	0.014128	24.59859	0.0000
6	0.360617***	0.013817	26.09952	0.0000
LN-TOT				
2	0.113400***	0.010298	11.01148	0.0000
3	0.182031***	0.016623	10.95071	0.0000
4	0.214668***	0.020105	10.67762	0.0000
5	0.231813***	0.021286	10.89064	0.0000
6	0.227208***	0.020855	10.89463	0.0000
LN-NRD				
2	0.113400***	0.011407	9.940898	0.0000
3	0.180669***	0.018427	9.804653	0.0000
4	0.211070***	0.022306	9.462545	0.0000
5	0.222988***	0.023638	9.433414	0.0000
6	0.212507***	0.023182	9.166791	0.0000
LN-ALT				
2	0.205765***	0.013340	15.42465	0.0000
3	0.350920***	0.021627	16.22631	0.0000
4	0.452221***	0.026279	17.20821	0.0000
5	0.522633***	0.027958	18.69349	0.0000
6	0.571785***	0.027528	20.77090	0.0000
LN-ARM				
2	0.174079***	0.005904	29.48689	0.0000
3	0.284308***	0.009490	29.95992	0.0000
4	0.357172***	0.011424	31.26410	0.0000
5	0.410276***	0.012037	34.08360	0.0000
6	0.447276***	0.011736	38.11214	0.0000
LNTRADE				
2	0.159656***	0.009181	17.39016	0.0000
3	0.259602***	0.014653	17.71635	0.0000
4	0.321303***	0.017522	18.33665	0.0000
5	0.355162***	0.018342	19.36376	0.0000
6	0.365557***	0.017767	20.57554	0.0000

*** show significance at 1.

Table 4. The Johansen test of cointegration.

Hypothesiz-No. of CoE(s)	Eigen-values	Traces-Test Statistics	0.05 the critical Values	Probs.**
None **	0.561	107.57	95.75	0.00
At-most-1*	0.515	68.831	69.81	0.05
At-most-2	0.285	34.741	47.85	0.46
At-most-3	0.206	18.915	29.79	0.49
At-most-4	0.137	8.0164	15.49	0.46
At-most-5	0.022	1.0689	3.841	0.30
Hypothesiz-No. of CoE(s)	Eigen-values	Maxs-Eigen Test Statistics	0.05 Critical Value	Probs.**
None	0.561	38.742	40.07	0.07
At-most-1 *	0.515	34.089	33.87	0.04
At-most-2*	0.285	15.826	27.58	0.68
At-most-3	0.206	10.899	21.13	0.65
At-most-4	0.137	6.9474	14.26	0.49
At-most-5	0.022	1.0689	3.841	0.30

*** is significance,** is significance, * show significance.

Table 5. System-dynamic model.

Variables	Coefficients	Std.errors	z.stats	Probs.	[95% c.is]	
LN-TOT	-.2529105***	0.069	-3.64	0.000	-.3890546	-.1167664
LN-NRD	.2061071***	0.056	3.66	0.000	.0957795	.3164347
LN-ALT	-.1487982*	0.071	-2.07	0.039	-.2898506	-.0077457
LN-ARM	-.1689399**	0.049	-3.41	0.001	-.2661078	-.0717721
LN-TRADE	.1623149*	0.077	2.10	0.035	.0111356	.3134942
_cons	15.58576***	0.205	75.85	0.000	15.183	15.98852
var(e.LNCO2)	.0032966***	0.000	4.95	0.000	.0019912	.0046019

*** is significance,** is significance, * show significance.

Table 6. The robustness ARCH model.

Variables	Coefficients	Std. errors	z.stats	Probs.	[95% c.is]	
LN-TOT	-.3150***	0.050	-6.21	0.000	-.414547	-.2155544
LN-NRD	.26730***	0.041	6.52	0.000	.1868931	.3477173
LN-ALT	-.2034***	0.045	-4.51	0.000	-.291811	-.1150124
LN-ARM	-.2469***	0.031	-7.89	0.000	-.3083217	-.1856424
LN-TRADE	.2255***	0.050	4.51	0.000	.1274709	.323641
_cons	15.646***	0.113	138.18	0.000	15.42495	15.86882

*** show significance at 1%.

The findings of the Johansen cointegration test of the variables are given in Table 4. The findings show that there is cointegration between all the variables and they include trace statistic of 68.83190 and the maximum eigenvalue statistic of 34.08991. This implies that the variables will most probably be interconnected to one another in the long term with the alternative energy sources the strongest connected.

An examination of the results in Tables 5 and 6 reveals that total natural resource rents, the use of alternative energy sources, and imports of agricultural raw materials are all significantly and negatively associated with carbon dioxide emissions in China. This means that the higher the values occur in these variables, the lower the cases of CO2 emissions. In China, depletion of natural resources and international trade were, however, positively related to CO 2 emissions. It implies that with the steps of these variables upwards, the intensity of CO2 emissions would increase as well. According to the results below, it can be deduced that natural resource depletion and total natural resource rents are significant at a 1 percent significance level. This implies that the possibility of the perceived values of the coefficients arising due to mere chance is only 1%, meaning that there is only a strong connection between the variables and the CO2 emissions in China. Other forms of energy are also very strong at 10 percent, and the importation of agricultural raw materials and international trade and trade are also 5 percent significant. Various energy supplies, farm crops, and imports of agricultural materials reduce the amounts of CO2. International trade and natural resource depletion are causes of the rise in CO2 emissions in China.

Every 0.01 percent rise in overall natural resources leads to a reduction in pollution of CO2 by 0.2529105 percent in China. It was found that an increment of percent by 1 percent in the total amount of natural resources led to a reduction in the amount of CO2 emission in China by 0.2529105 percent. The determination of this relationship was arrived at through regression analysis, and the value of the correlation coefficient between the two variables was checked. The witnessed decline in CO2 emissions can be attributed to a number of aspects. Possible reasons are that, due to the greater availability of natural resources, more energy-efficient patterns of production and consumption could be governed. Increased efficiency in the use of resources can mean better energy efficiency and less dependence on carbon-intensive sources of energy. Further, economic growth that is linked to the availability of more resources can also act as a deterrent to emissions. With increasing countries developing and increasing industry, there is a change to more sustainable and cleaner technologies, which has led to a decrease in carbon emissions.

The CO2 emission in China increases by 0.2061071 percent as a result of the 1 percent rise in the depletion of natural resources. Due to the natural resources required in energy production, greenhouse gases are emitted into the atmosphere. Resource depletion is an increase in the supply of non-renewable resources like fossil fuels, minerals, and other natural resources. Because of the demand increase in these resources, with the scarcity of the resource, extraction and usage increase. The subsequent rise in consumption of goods and services will consequently enhance the level of CO2 emissions. The relationship between the depletion of natural resources and the emission of CO2 can be revealed with the help of the concept of the carbon footprint used in China. Greenhouse gases are emitted due to human activities, which involve the extraction/ production of resources, which is also known as the carbon footprint. More emissions are produced as natural resources are being exhausted in the course of extraction, processing, and transportation of natural resources. Unless we curtail our dependence on natural resources, we will observe more rises in CO2 emissions and probably experience more consequences of climate change. This way, we can rely less on the natural resources and the impact of global warming. This observation is very vital because it implies that carbon emissions could be greatly influenced by minimizing the use of natural resources.

An increment of 1 percent in the sources of energy considered as alternatives reduces the emission of CO2 in China by 0.1487982 percent. This reduction might not really sound significant, but it can have a great payback on the environment when it is applied to the high energy consumption of the US. Efforts should continue to ensure a greater percentage of the energy consumed is produced by alternative sources to reduce CO2 emissions and hence stop climate change. This transition has enabled a reduction in the amount of carbon dioxide emitted, helping the environment and reducing carbon dioxide-related illnesses. The 1 percent increase in the alternative energy source has already led to a decline of 0.1487982 percent in emissions of CO2. With such a trend, the country is greatly headed towards attaining the sustainability goals of the country.

A one percent rise in agricultural raw material imports reduces the CO2 emissions in China by 0.1689399 percent. This is a very significant reduction, and it reveals that the agricultural imports have a positive influence on the environment. The research points

out that agricultural imports should be invested in, because they increase the economy and decrease the amount of CO2 emissions. With the export of agricultural raw materials, the US is able to lower its dependency on its US production and reduce food loss. Finding of the study indicates that growing the imports of agricultural raw materials in China can have a positive environmental effect. It not only lowers the amount of CO2 emissions but also allows food waste to be reduced.

The increment of international trade by 1 percent raises the CO2 emissions in China by 0.1623149 percent. This rise in emissions is chiefly as a direct result of the growth in the exploitation of fossil fuels to facilitate transportation, especially concerning the transportation of goods across border lines. This presents an implication that the production of goods and services to be traded in the global market is very much environmentally. As international trade continues to grow, its contribution to greenhouse gases rises too. Thus, the international trade-related emissions might be even greater. The facts indicate that in order to address the issue of climate change, one will have to decrease the amount of international trade. One way to do this would be to shut down some of the goods and services produced for international business or invest in more effective means of transportation.

CONCLUSIONS AND RECOMMENDATIONS

Loss of natural resources is a major challenge to the environment and living conditions of societies worldwide. The degradation of the environment due to the continued exploitation of the limited resources at an alarming rate has resulted in environmental degradation, stagnation of the economy, and low quality of life among many residents. The other immediate effect of the depletion of natural resources is the reduction in the amount of resources that human beings have to utilize. The scarcity of resources would make them costly to acquire, thereby making them harder to get. It may cause the stagnation of the economy, where the businesses are unable to take in the materials that they require to create goods and services, or even degrade the lives of the poor who are not able to access necessary resources. Increased scarcity of resources means that they are in high demand, raising competition and conflicts among nations and regions.

China is also capable of providing renewable energy with the appropriate incentives and policies. Policies like renewable portfolio standards and clean energy standards, on the other hand, can assist in ensuring that these sources of energy are used. The reduction of CO2 output in China has already resulted in a lowering of the amount of output, and the possibilities to further reduce it are high. Along with the policies, businesses and individuals also have a chance to reduce the emission of CO2. The long-run forecasts show that the environmental policy implications in China have been destroyed by the depletion of natural resources. This is worrying because China has a long history of taking initiatives in environmental matters. This must begin by finding the causes of depletion of natural resources. This can be achieved by finding out the current consumption levels used by the United States, and the effects that the consumption of other resource-using countries to China. As soon as the culprits of depletion are established, it is possible to counter them to the extent achievable. This may involve the introduction of actions that would discourage the use of resources, e.g., step up the economic incentives to use renewable resources. The other significant action that should be taken is putting in place measures that will lead to the future aversion of the depletion of living stocks.

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