Socio-Economic Drivers of Renewable Energy

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Renewable energy is a viable source of energy due to its lower CO_2 emissions as compared to non-renewable energy resource. This research highlight the factors affecting renewable energy in BRICS.

CO2 emissions clean environment sustainable development renewable energy

1. Introduction

The social, economic, and ecological life of future generations requires some efficient decisions today. Therefore, the world is striving to achieve sustainable development. In 2015, 193 countries resolved to achieve sustainable development goals [1]. This plan aims reducing poverty, inequality, and improve environmental quality. It is often debated in international forums that environmental pollution and income inequality are making obstacles in the way of achieving sustainable development goals [2]. Therefore, the United Nations Organization (UNO) pointed out the importance of efficient strategies to mitigate the problems of climate change and inequalities in all nations [3][4].

Sachs [5] argued that countries have made progress in terms of the growth of their economies, but most have failed to address the problems of establishing welfare societies and environmental pollution. To establish harmonious societies, the most important obstacle is income inequality. Since the last decades, the world has been facing the rapid deterioration of income distribution [6]. This hasty worsening of income allocation has attracted scholarly attention in examining its dynamics in developed and developing countries [7]. Along with the developed world, income distribution is rapidly worsening in developing countries.

Environmental degradation is also an obstacle to achieving sustainable development goals. To achieve more economic growth, the developed and developing countries are consuming natural resources without considering the environmental effects. Rapid population growth and the growing role of globalization is depleting fossil fuels [8]. According to recent reports by BP statistical assessment, 75% of the world's leading energy consumption is generated from crude oil, coal, and natural gas. The use of fossil fuels lowers the efficiency of energy and creates environmental crises by emitting greenhouse gasses such as carbon dioxide (CO_2). Despite the collective efforts of the world to reduce the concentration of CO_2 emissions, it continues to increase rapidly. Therefore, to achieve sustainable development, it is essential to reduce the concentration of CO_2 emissions. In this scenario, renewable energy has become an important alternative source to compensate for the energy requirements to achieve sustainable growth [9]. Renewable energy is a viable source of energy due to its lower CO_2 emissions as compared to non-renewable energy resources. Shahbaz et al. [10] argued that the emissions of CO_2 are linked to the use of

non-renewable energy resources, and it is imperative to consume renewable energy resources to reduce environmental pollution.

Due to irregular changes in oil prices and energy protection issues, the world is shifting its energy demands towards renewable energy resources [11]. The consumption of renewable energy has increased from 2007 to 2017 by 16.4% but this share is still low as it only accounts for 4% of the total energy consumption.

Research Gap

In this manner, the increasing concern over environmental pollution and the rising problem of inequality in the distribution of income has created a new aspect to investigate linkages between climatic pollution with socioeconomic issues. Therefore, it is imperative to investigate whether income inequality has an impact on environmental quality or not [12]. Many researchers now examine the impact of income inequality on ecological indicators, but there has not been harmony on the experimental level. Some argued that climatic issues are initiated from income and authoritative inequalities, but some intellectuals are of the view that income inequality may increase or may not affect environmental pollution. Although there is enough literature that provided the link between inequality in income and renewable energy, even though the shock of inequality in the distribution of income on clean energy is ignored. The recent studies which find the key drivers of renewable energy are Torras and Boyce [13] and Uzar and Eyuboglu [14]. Among the available studies, which probe the environmental, economic, and political determents of clean energy, the social aspect of economic unfairness has not been fully exploited. Clean energy helps in improving air quality, but it is affected by income inequalities. For instance, when fair income prevails in any society it may boost the concerns of the society for a cleaner environment. Therefore, the demand for cleaner air may affect the demand for renewable energy. In this regard, it is important to probe the potential association between renewable energy and income inequality regarding environmental pollution.

2. Socio-Economic Drivers of Renewable Energy

According to Laurent [15], there are three pillars of sustainable development, namely; economic, ecological and social. Moreover, economic-social and economic-ecological connections have been analyzed but the social-ecological connection is still vague. Therefore, there are very few studies on this subject that lack theoretical background from a potential link between renewable energy, economic and inequality that can be traced from the past studies on income inequality and climate.

Berthe and Elie [16] performed a comprehensive study to probe the potential link between economic inequality and clean energy by providing sound background literature between both variables. However, Uzar [17] used the practical method of Berthe and Elie [16] to examine the possible connection among the estimated parameters.

According to Uzar [17], individual economic preferences can affect environmental quality through consumerism. Boyce [18] stated that societies with greater income inequalities compete for social status. In doing so, some consume to maintain their status, and some consume to increase their status. In such circumstances, when

production has increased, the maintenance of the machinery affects the costs of the goods. As a result, the prices of goods increase which make it difficult to maintain production. Comparatively, renewable energy is more costly (i.e., initial cost) than fossil fuels. Particularly as there is a lack of awareness in the society especially for the people in the low-income bracket. Therefore, preference is given to traditional means i.e., fossil fuels without considering the cost and affordability of renewable energy to be used.

Consequently, a society with more income inequality cannot predict the long-term negative effect of fossil fuels. The poor can believe that economic escalation can lift their status in society. In this regard, economic profit may overcome environmental benefits. According to Laurent [15] and Berthe and Elie [16], Europeans and Americans have shown more concerns about employment and economic growth than environmental problems. Thus, individualism, consumerism and short-termism may shape the utilization of renewable energy in discordant societies.

According to Mehmood [19], Pakistan, India, Bangladesh, and Sri Lanka need to revise their international trade policies to reduce carbon dioxide emissions. Tariq et al. [20] explored environmental Philips's curve for South Asian countries. It was found out that there was economic sustainability by increasing the share of renewable energy sources. Moreover, there are research studies that focused on the importance of institutions in determining climatic policies [21][22]. Institutional factor such as corruption is perhaps the important aspect in presenting the link between economic inequality and climatic pollution. Income inequality can be a factor of a weak government. According to a study by Wolde-Rufael and Idowu [12], corruption can weaken strict ecological regulations. Similarly, Fredriksson and Svensson [23] argued that corruption can hamper competent investments in clean energy projects.

Since the last few years, the problems of income inequality and environmental pollution have attracted worldwide attention. Most studies have focused on the impacts of economic inequality on ecological factors like emission of CO_2, water pollution, environmental footprints, and air pollution. A review of these studies indicated heterogeneity based on the obtained empirical results.

Torras and Boyce [13], researched on 58 countries and found that income inequality affects environmental pollution negatively. Golley and Meng [24] provided evidence that reducing the inequality in China significantly reduced the rate of household emissions. In the United States of America, Baek and Gweisah [25] investigated the nexus between unfairness in income and CO_2 emissions. The result found that fair income distribution reduces the emissions of CO_2 in the long and short-run dynamics. A study by Jorgenson [26] indicated that inequality in income increases the intensity of CO_2 released for OECD and non-OECD countries. Liu et al. [2] analyzed obtained data of 1997–2015 for the USA and establish that income distribution positively affects CO_2 emissions in the short-run, but negatively in the long run. Uzar and Eyuboglu [14] analyzed the effect of income inequality on the emissions of CO_2 in Turkey. The result shows that improvements in income inequality lower the emission of CO_2.

Some studies, however, could not find a significant association between income inequality and environmental pollution. Scruggs [27] conducted a study for a group of economies and revealed that income distribution has no significant impact on environmental quality. Ravallion et al. [28] studied the effect of income disparities on CO_2

emissions for different countries from 1975 to 1992 and showed that economic inequality condensed CO_2 emissions. In another study by Wolde-Rufael and Idowu [12], the relationship between income inequality and emission of CO_2 for India and China was probed over the periods of 1971–2010 and 1974–2010, respectively. Statistically, no significant connection between the two variables was found. Unlike Liu et al. [29], Wolde-Rufael and Idowu [12] observed the significant role of inequality in the distribution of income in improving environmental quality.

The role of renewable energy is debated widely for its environmental friendly effects [30]. The probability of renewable energy to improve air quality has led the research community to find its possible determinants for different countries. From the literature, available studies have probed the association between GDP, emission of CO_2, employment, trade openness, and energy prices. Additionally, some research studies have been done to investigate the political factors of renewable energy [21][22][31]. Sadorsky and Perry [32] computed the annual data obtained from 1980 to 2005 for G7 countries and found that emission of CO_2 and income (per capita) are the key drivers for renewable energy. From examining the relationship between renewable energy and real GDP in twenty OECD nations, Apergis and Payne [33] established the two-way causality between the variables. In a study by Rafiq et al. [34], the connection between the emission of CO_2, GDP, and renewable energy for China and India was evaluated. The study found a bidirectional causality among the three variables in India but bidirectional causality between renewable energy and emission of CO_2 resources in China. Apergis and Payne [35] investigated the connection between economic and environmental features for seven African economies. The result indicated a positive relationship between the variables (emission of CO_2, GDP, and renewable energy). Ben Jebli and Ben Youssef [36] probed the relationship between renewable and non-renewable energy, CO_2 emissions, GDP growth, and trade openness for the years 1980–2009. The study found the unidirectional causality among the dependent variables and renewable energy.

Few studies have paid attention to the political factors of renewable energy. For example, Cadoret and Padovano [21] argued that corruption control positively affects renewable energy while lobbying decreased renewable energy production in European countries. Sequeira and Santos [22] observed that democracy increases renewable energy resources. Hence, there is extensive literature available, which find the political, economic, environmental determinants of renewable energy, but studies that probe the economic unfairness of renewable energy consumption linkages are quite a few in number. Among those studies, Apergis [37], attempted to correlate the association between renewable energy and income inequality for 32 OECD nations during the years 1998 to 2013. The impact on income inequality was statistically positive and robust across the different types of renewable energy sources. Recently, Uzar [17] performed a panel study for 43 countries to study the impact of income inequality on renewable energy and found that improved distribution of income will enhance the consumption of renewable energy. However, the panel study can have some limitations to provide policy instruments for specific countries [17].

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