Economic Growth and CO2

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This entry explored the effect of energy consumption and economic growth on CO2 emissions. The relationship between energy consumption, economic growth and CO2 emissions was assessed using regression analysis (the pooled OLS regression and fixed effects methods), Granger causality and panel cointegration tests. Data from 70 countries between 1994–2013 were analysed. The result of the Granger causality tests revealed that the study variables (population, capital stock and economic growth) have a bi-directional causal relationship with CO2 emissions, while energy consumption has a uni-directional relationship. Likewise, the outcome of the cointegration tests established that a long-run relationship exists among the study variables (energy consumption and economic growth) with CO2 emissions. However, the pooled OLS and fixed methods both showed that energy consumption and economic growth have a significant positive impact on CO2 emissions. Hence, this study supports the need for a global transition to a low carbon economy primarily through climate finance, which refers to local, national, or transnational financing, that may be drawn from public, private and alternative sources of financing. This will help foster large-scale investments in clean energy, that are required to significantly reduce CO2 emissions.

Keywords: climate change ; climate finance ; economic growth ; CO2 emissions ; energy consumption

1. Overview of Greenhouse Gas Emissions

Greenhouse gases have been categorised as atmospheric gaseous constituents, both anthropogenic and natural. These constituents are known to imbibe and emit radiation at certain wavelengths within the spectrum of infrared radiation emitted by the clouds, atmosphere and the surface of the Earth. Hossain [11] and Paiva et al. [12] asserted that greenhouse gases remain a significant cause of climate change and global warming. This is consistent with Resnik's [13] argument that the adverse effects of climate change due to greenhouse gases on human health, the environment and society are profuse. Hence, Meltzer [14] concluded that over 150,000 deaths per year are attributed to the resultant effects of environmental pollution. Although there are many greenhouse gases, CO_2 is attracting more recognition due to its persistence in the atmosphere and for its use as a baseline for estimating the global warming potential (GWP) of other greenhouse gases [15][16][17]. Rahman [18] added that between 1990 to 2013, the greenhouse gas concentration has increased by 34% with over 80% of this figure being a resultant effect of CO_2 emissions. This is in line with Amri's [19] assertion that CO_2 emissions have increased significantly from 67 million metric tons to 134 million metric tons. Considering that the rising CO_2 emission level remains a global concern [18][20], it is crucial to explore the drivers of CO_2 emissions [21][22]. Based on previous studies (Table 1), one could conclude that energy consumption and economic growth are the two most mentioned drivers of CO_2 emissions.

Table 1. Drivers of CO_2 emissions (summarised from the literature).

Authors	CO_2 Emissions Drivers
Stolyarova [23]	GDP and energy consumption.
Sharma [24]	Per capita GDP and urbanization.
Cetin and Ecevit [25]	Energy consumption and urbanization.
Keho [26]	The share of industrial sector in GDP, per capita income and trade openness.
Zakarya et al. (2015) [27]	GDP, energy consumption and Foreign direct investments.
Ab-Rahim and Xin-Di [28]	Energy consumption, trade openness and economic growth.
Jiang and Guan [29]	GDP per capita, population, carbon intensity of energy and GDP energy intensity.

Authors	CO_2 Emissions Drivers
Jiang et al. [30]	Social consumption and consumption behaviour.
Talbi [9]	Economic growth, population size, fossil energy consumption, clean nuclear energy use, renewable energy and waste energy conversion.
Wang and Lin [10]	Urbanization, energy structure, GDP and energy intensity

2. Economic Growth and CO_2

In recent times, several studies have focused on understanding the link between energy consumption, economic growth and CO_2 emissions [5]. Nevertheless, the relationship that exists between these variables has been explained in different ways [18][20].

Scholars have focused on different periods and countries, while using different energy usage proxy variables. This has given rise to some inconsistencies in the findings and results across these studies [35][42]. Hence, the different studies analysed suggest that there is a need to take policy-related actions to address these outcomes [11][17]. It is, therefore, not surprising that efforts are being made at the global scene to further prevent the effects of CO_2 emissions by fostering a low carbon economy [1][43].

3. The Role of Climate Finance in the Transition to a Low Carbon Economy

Organisations such as the United Nations (UN) and the Intergovernmental Panel on Climate Change (IPCC) have taken different actions and measures in addressing climate change issues [3]. Worth mentioning is the 13th Conference of Parties (COP) held in 2007 at Bali in which the stakeholders presented finance as a pivotal factor to address climate change issues [44]. Thus, the emergence of the concept of “climate finance”. Even though the concept lacks a generally accepted definition, it is perceived as the resources invested in climate change mitigation and adaptation measures [44][45]. The 2009 COP held in Copenhagen further affirmed the importance of climate finance in combating global climate change. This led to the generation of over $30 billion in aid between the period of 2010 to 2012 from developed countries to developing economies [14]. Also, an additional mobilization for $100 billion a year by 2020 was proposed by developed economies to developing economies. This is scheduled to extend until 2025. This is in line with the argument by Steckel et al. [46] that even though most of the CO_2 emissions come from developed countries due to industrialization, it is essential to involve both the developing and emerging economies in the fight against the reduction of global emissions.

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