Review Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2024.55.008685

Population Growth and Environmental Resources: A Short Note on their Relationships and Consequences and Impacts

Chee Kong Yap[1]*, Rosimah Nulit[1], Wan Mohd Syazwan[1], Hishamudin Omar[1], Kennedy Aaron Aguol[2], Munir Mohd Nawi[3] and Chee Seng Leow[4]

[1]*Department of Biology, Faculty of Science, Universiti Putra Malaysia, Malaysia*

[2]*Centre for Promotion of Knowledge and Language Learning (CPKLL), Universiti Malaysia Sabah, Malaysia*

[3]*Akuatrop, Blok C, UMT, 21300, Kuala Nerus, Terengganu, Malaysia*

[4]*Humanology Sdn Bhd, 73-3 Amber Business Plaza, Jalan Jelawat 1, 56000 Kuala Lumpur, Malaysia*

***Corresponding author:** Chee Kong Yap, Department of Biology, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

ARTICLE INFO

Received: February 14, 2024

Published: February 28, 2024

Citation: Chee Kong Yap, Rosimah Nulit, Wan Mohd Syazwan, Hishamudin Omar, Kennedy Aaron Aguol, Munir Mohd Nawi and Chee Seng Leow. Population Growth and Environmental Resources: A Short Note on their Relationships and Consequences and Impacts. Biomed J Sci & Tech Res 55(2)-2024. BJSTR. MS.ID.008685.

ABSTRACT

Resources and the environment are significantly impacted by population increase. This study aimed to analyse the literature on population growth and the environment and create a qualitative information synthesis concerning the well-known common effects of environmental pressures brought on by population expansion. The following five results can be interpreted as an increase in the human population based on the complete body of literature retrieved from the Scopus database. First and foremost, resource consumption is rising; second, habitat loss and biodiversity loss; third, the environmental stresses due to human activities on ecosystems; fourth, increased waste output; and fifth, expedited climate change is worsening due to the continuous rise in greenhouse gas emissions. The increase in energy consumption, food demands, transportation needs, and industrial activity are the main contributors to the aforementioned factors.

Keywords: Human Population; Environmental Stresses; Habitat Loss; Environmental Impacts

Introduction

Global human population expansion is seen as the main culprit by politicians, investigative journalists, and environmentalists (Figure 1) [1], which is a unidirectional and negative attitude [2]. Although it is assumed that only a little has been created in this field over the past 200 years, the demography is expected to explore both the good and negative consequences of the link between the environment and human population expansion. Despite a few empirical investigations, a review of the research literature reveals no viewpoint that goes beyond the Malthusian perspective [2,3]. The effects of mankind's population growth on the environment have been extensively studied and/or discussed [4-43]; that includes resource depletion (agricultural land taken up by urban growth, soil loss, desertification, loss of biodiversity, decreased availability of minerals, and declining petroleum reserves) and resource degradation (soil, air and water pollution) [2-3]. Human migration, settlement and re-settlement patterns, how they relate to and interact with the physical environment, resource depletion and degradation features, and socially beneficial changes should be the focus of population specialists' research [2-3].

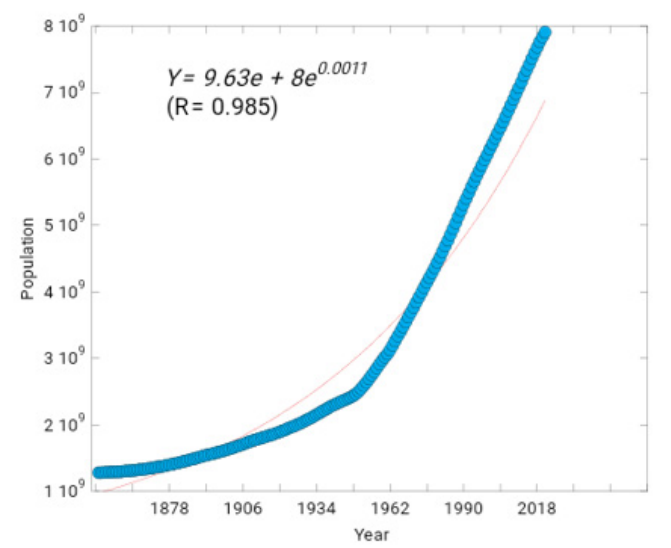


Figure 1: Population size from 1950 to 2021. Data published by United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Online Edition. https://population.un.org/wpp/; https://ourworldindata.org/population-growth(Accessed on 14 October 2023).

Jolly [4] asserted that the world now faces a critical population growth explosion issue. However, it is a misconception to claim—as some do—that efforts to reduce child mortality via, for example, immunisation should be abandoned as a strategy for lowering population increase.

(i) The population growth rate is only marginally impacted by decreasing child mortality.

(ii) Reducing the number of conceptions results in improving child survival.

(iii) The ratio of people to land is not the primary cause of environmental strain.

(iv) The developed world's wealth is primarily responsible for the strain on the supply of resources [4].

Overpopulation is assumed to be the primary driver of the rise in energy consumption and its environmental effects [4]. The popular catchphrases "sustainable" and "sustainability," which are related, have gained popularity and are used to characterise several behaviours that are often ecologically commendable, according to Bartlett [5]. In addition, because human demands and environmental requirements regularly clash, the word "compromise" is used more frequently. A quick analysis of the compromise issue reveals that even a sequence of ten concessions, each saving 70% of the remaining environment, only saves 3% on the ground overall. The meanings of "sustainable" and "sustainability" are not particularly clear, especially when compromises are involved, based on how the terms are employed." Mao [30] claimed their research has significant theoretical and practical implications for social and economic study, coordinating development, maximising local integrated benefits, and controlling industrial structure. Focusing on the best human-land system as a starting point and applying systematic science and systematic analytical techniques might provide a scientific foundation for policymaking at the county level [30].

Legrand [23] studied and considered the potential policy ramifications of the environmental consequences of population expansion worldwide. The ethical implications of population growth, the complexity of environmental processes, the concentration of negative effects of population growth on renewable resources rather than non-renewable resources, the need for non-coercive efforts to slow population growth, and the impact of challenging political and administrative issues were the main topics of discussion. Dimitrov et al. [11] considered populations with random ageing and exponential growth or decay. They pretended that the calendar time was divided into equal-length segments. The objective of this study was

a) To review the available publications on population growth and environment, and

b) To make a qualitative synthesis of the information in connection to the known common consequences of environmental stresses due to population growth.

Methodology

In this review paper, the keywords 'population growth environment' were used to find the available papers based on the Scopus database between 1992 and 2018, searched on January 5, 2019. Out of

the search, only titles with the three keywords were selected. After screening and reading the abstracts for the relevancy and suitability for this review objective, only 35 papers were picked up.

Results and Discussion

One potential strategy for slowing the world's accelerating population growth is to enhance the use of produced energy worldwide for labour-saving purposes [4]. Barbat [4] contends that rising wealth has traditionally been linked to lower birth rates, smaller families, and slower rates of population expansion. According to population ecology research, the driving force behind decreasing birth rates is a reduced reliance on children for security or income due to growing automation, mechanisation, and a corresponding reduction in the necessity for physical labour. Other elements, including higher levels of education or abortion, statistically have less of an impact on birth rates. They discovered that the global rate of electric energy consumption would need to increase by 30 to 40 times to maintain global population stability at a total population four times higher than it is now. The economic viability, the speed at which the resources could be applied to the population problem, and the size of the world's overall future energy needs are all considered when evaluating the world's developable energy resources. Interestingly, they [4] indicated that, according to their analysis, only nuclear energy based on uranium appears to be able to meet these high energy demands without posing a major risk to human health. Additionally, nuclear energy reduces the "greenhouse effect" of atmospheric carbon dioxide, which reduces the possibility of an increase in sea level of 30 to 60 metres due to the melting of the polar ice caps. However, other possible risks are within safe control, making uranium-based nuclear energy the most likely choice to meet the global projected energy needs for population stability [4].

Hawthorn [15] made a modest attempt to show that population in and of itself does not pose a significant threat to the environment as a source of resources or an amenity. It is emphasised that not only does it appear that Europe's population is no longer increasing at even the rate predicted less than ten years ago, but that careful consideration of the simplistic relationship between population growth and environmental degradation also reveals that some current economic and social trends may even be advantageous. They predicted competing rights to use the environment as an amenity would be an issue. From the perspective of mathematical modelling, Smith and Mead [38] noted that a counter-intuitive property of these models is that, given a specific degree of environmental variability, a bigger mean population might result in instability. Migration is either stabilising or destabilising depending on how the effects of various changeable environments are balanced. According to Fuggle [13] (1978), the most urgent environmental issues in South Africa are being experienced in the country's regions where explosive population increase is occurring most rapidly: our metropolitan towns and our African homelands. There is minimal planning to lessen the stress of urban life, high levels of soil, air and water pollution, issues with landfills and waste management, and noise abatement. Because there are few alternative resource bases in the homeland, population pressure is considerable and immediately affects the ecosystems. The ecosystems in South Africa can sustain a growing population for a long time, but we must acknowledge that some regions of our nation are already stressed. Our priority should be to address these issues while preventing the emergence of new ones due to uncontrolled population growth.

When the connection between population increase, anthropogenic activities and the physical environment is considered, Hogan [3] recognized how little demography had progressed beyond Malthusian arithmetic. Localized empirical research must be emphasised and include all population growth mechanisms. Integrating ecological boundaries with the typical research units in these fields remains a problem for demographers and other social scientists [3]. Hogan [3] addressed these issues and proposed that migration and settlement patterns and their connections to the physical environment are a top contender for the attention of population specialists. According to Scherr [35], theories of induced innovation proposed that microeconomic changes related to population expansion may also drive technical and institutional advances in natural resource management. Empirical data from tropical hillside ecosystems support these possibilities. However, compared to population and market expansion, the rate of innovation could be more moderate. To speed up the process and stop ecosystem degradation and impoverishment as populations rise, public policies that encourage land-improving technologies, foster the social institutions necessary for good resource management, and enhance resource values through public investments and price policies are crucial [35]. The effective distribution of conservation efforts depends on our future leaders, in particular, being thoroughly aware of human population increase, consumption trends, and environmental consequences [16].

An evaluation of the knowledge and attitudes of undergraduate university students majoring in various fields in the United States of America (USA) and Costa Rica (CR) on population- and environment-related issues was conducted using a written questionnaire, according to Holl et al. Their findings showed a need for more understanding of the relationship between human population growth and the environment. USA (American) students and male students answered factual questions about demography and global environmental change more frequently than CR (Costa Rican) students, who were nonetheless generally more pessimistic about environmental quality and the planet's carrying capacity [16]. The individual utility is determined by the following three criteria, according to Liu et al. [27], relating environmental pollution with the output: consumer items, population growth rate, and environmental pollution. A model for endogenous population growth has been developed to determine the production and pollution growth levels and the best method for environmental management [27]. Organisms in variable settings must continuously alter their behaviour to survive, claim Kussell and

Leibler [21]. They demonstrated that when the environment changes seldom, stochastic switching might be preferred over sensing. They established a link between the organism's long-term development rate and its knowledge about its shifting surroundings.

Mallick and Ghani [29] discussed how affluent nations have effectively completed their demographic transition whilst developing nations are still in various phases of this process. They argued that poverty levels significantly impacted population growth rates in emerging nations. They discussed a study of several schools of thought's analyses of the connections between population, poverty, and the environment. They offered many policy alternatives to achieve the shared objective of sustainable population increase. The dual issue of population pressure, excessive consumption, and the ensuing environmental deterioration was explored by Searle [36]. It became clear in the 1980s that population growth, poverty, environmental deterioration, and resource scarcity were escalating at a rate that could not be sustained for very long [7]. According to Laakso et al. [22], typical population models presume that the relationship between environmental variability and population renewal mechanisms is constant. They investigated adaptive, density-dependent population dynamics in a population of individuals that differed in where they performed best concerning a stochastic and auto-correlated environmental variable, such as temperature, humidity, or salt. Models assuming constant amounts of genetic variability (equilibrium variance) may not help foresee the effects of environmental changes since the spectrum of environmental noise impacts genetic variance and diversity and fluctuates temporally.

A single-species model with a stage structure in a contaminated ecological environment was taken into consideration by Yu et al. [42]. They used the Lyapunov approach to create the necessary circumstances for the species to become extinct, provided the outside toxin input quantity is steady. In a developing country where income promotes well-being through status and fertility is endogenous, Lehmijoki and Palokangas [24] looked at pollution. A nation is competitive in capital-intensive "dirty" commodities when its environmental enforcement is weak. Trade benefits from trade liberalisation raise income and accelerate population expansion. Strong savings incentives encourage investment, which slows down population growth. Production of capital-intensive filthy products first rises and then falls due to population growth squeezing the labour force. This results in a classic environmental Kuznets path, where pollution rises in the early stages of growth but falls in the later stages [24]. The debate over sustainable growth has focused heavily on the connection between economic expansion and environmental degradation and/or deterioration [28]. Utility growth, which has a positive correlation with economic growth and a negative correlation with environmental deterioration, was utilized by Liu et al. [28] as a gauge of sustainable growth. In this economy, skilled and unskilled labour is utilised, and population expansion over time produces growth without scale effects. While the sustainable growth rate is higher in an economy with a state-backed social planner, the population growth rate is higher in a decentralised economy. In both economies, a greater population growth rate is related to a faster sustainable growth rate.

The degree to which population increase contributes to environmental deterioration is controversial [41]. According to Weber and Sciubba [41], regional-level studies can offer more reliable evidence by separating the population effect from country particularities like policies or culture. They created a dataset of 1062 areas in 22 European nations (EU Member states). Between 1990 and 2006, they examined the impact of population increase on CO_2 emissions and changes in urban land use. They discovered a strong correlation between regional population growth and increases in CO_2 emissions and urban land use in Western Europe. However, other elements seem more significant among the new EU member nations in Eastern Europe. The biggest environmental stressor is the ever-increasing human population expansion worldwide and its associated consumption habits [34]. Every biological environment suffers from the effects of population growth [34]. Environmental issues related to overpopulation are severely under-reported, under-recognized and under-publicized [34]. Peacock [34] investigated how scientific knowledge of ecosystem functioning could improve a person's understanding of how unchecked population expansion affects ecosystems' natural order and the potential problems that may follow.

Impacts of Population Growth based on Countries

Figure 1 presents population estimates from 1950 to 2021 based on historical demographic trends. It also includes projections for the year 2100 based on various demographic scenarios. This outcome is in the same trend of increment when annual total emissions of carbon dioxide (CO_2), excluding land-use change, measured in tonnes per person from 1950 to 2021 (Figure 2).

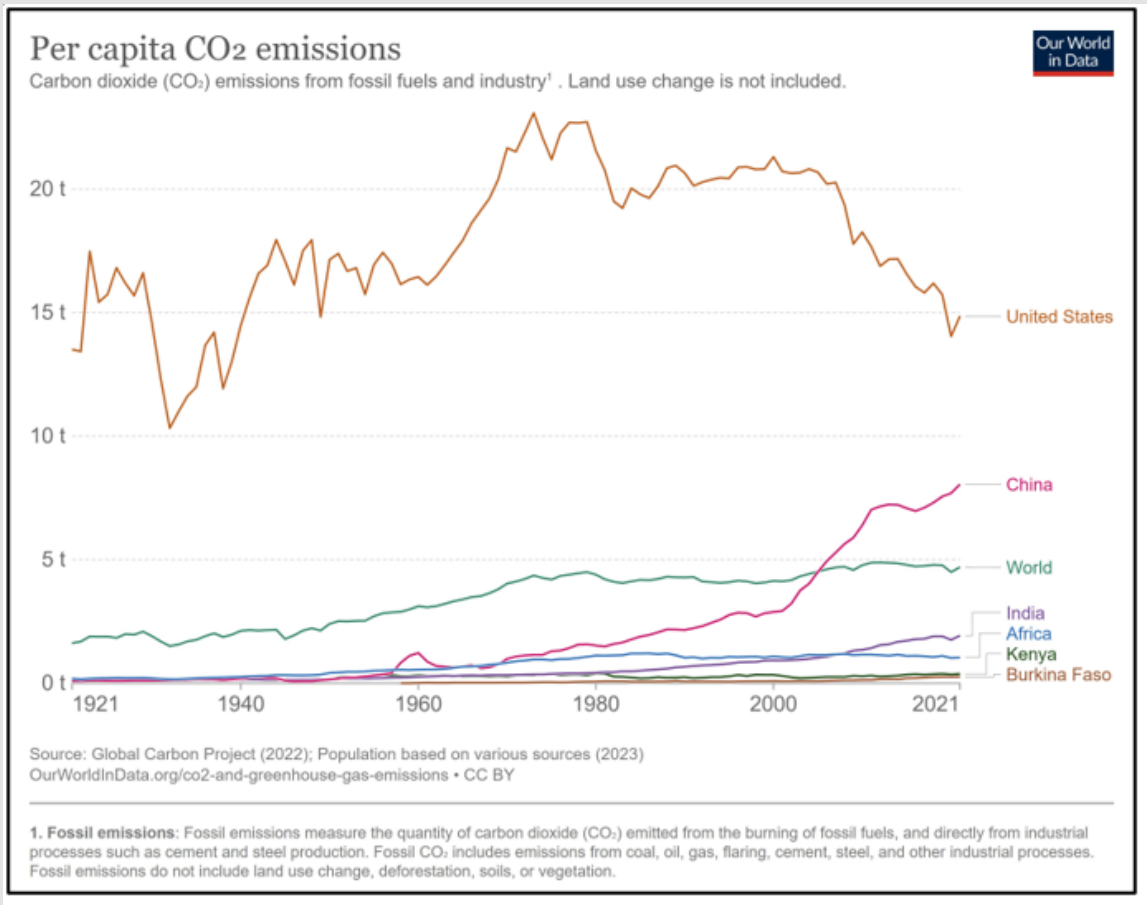
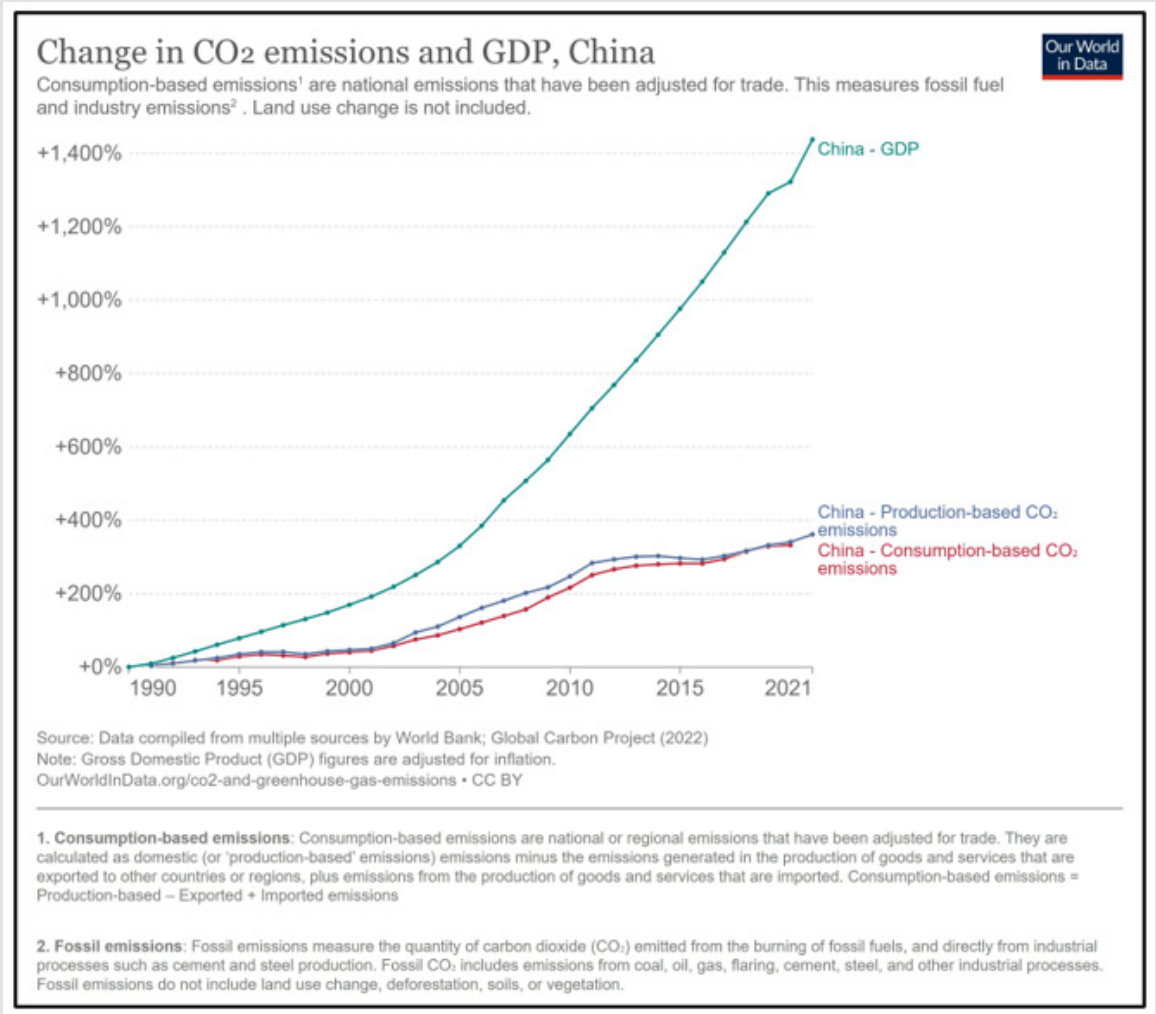


Figure 2: Annual total emissions of carbon dioxide (CO_2), excluding land-use change, measured in tonnes per person from 1950 to 2021. Source: Data is originally reported from Friedlingstein, P., O'Sullivan, M., Jones, M. W., et al.: Global Carbon Budget 2022, Earth Syst. Sci. Data, 14, 4811–4900, https://doi.org/10.5194/essd-14-4811-2022, 2022. https://globalcarbonbudget.org/. https://ourworldindata.org/ (Accessed on 14 October 2023).

China: Changes in China's CO_2 and gross domestic product (GDP) from 1990 to 2021 are presented in Figure 3. China increased its CO_2 emissions whilst increasing GDP much faster (Figure 3). This could be a model of a developing country taking China as a fast-growing developing country in terms of GDP increment. In other words, China could not reduce emissions whilst increasing GDP, which is always far higher than the percentages of CO_2 emissions. In China's Henan Province, Zhao [43] investigated how population expansion affects environmental deterioration. The province Statistical Yearbook served as the source of the data. Henan Province saw a rise in population from 41.74 million to 91 million people between 1949 and 1995. Even with successful birth control, the population will exceed 97 million after 1996 [43]. Domestic sewage production grew from 10 million to 710 million tonnes between 1965 and 1995. The amount of woodland in the Xin Yang District has considerably decreased due to anthropogenic activities. Soil erosion, which accounts for around 78% of mountain area, results from declining forests. Silt contaminates rivers. The results of the Henan province's 1995 Annual Environment Report on wastewater, emission gases, solid wastes, pollution of the four main riverine systems, air, noise, and garbage pollution in cities, as well as pollution from industry, enterprises, and agriculture in rural areas, corroborated their findings. They suggested that the province develop a strong leadership structure, implement an effective birth control strategy, safeguard the environment, and lessen pollution. The Chinese population is the world's biggest single-iteration experiment, according to a study by Li et al. [26]. A stringent birth control programme adopted by the Chinese government has resulted in a 300 million reduction from the current population. Population was examined as a dependent variable, while time and environmental resources were examined as independent factors. A peak in Chinese population was predicted by resource analysis and existing rates of population increase.



Note: PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP is the sum of gross value added by all resident producers in the country plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for the depreciation of fabricated assets or for the depletion and degradation of natural resources. Data are in constant 2017 international dollars. Statistical concept and methodology: For the concept and methodology of 2017 PPP, please refer to the International Comparison Program (ICP)'s website (https://www.worldbank.org/en/programs/icp).

Figure 3: Change in carbon dioxide (CO_2) and gross domestic product (GDP) of China from 1990 to 2021. https://ourworldindata.org/ co_2-and-greenhouse-gas-emissions (Accessed on 14 October 2023).

United States: Changes in CO_2 and GDP of the USA from 1990 to 2021 are presented in Figure 4. The USA reduced CO_2 emissions whilst increasing GDP (Figure 2). There is a strong link between CO_2 emissions, prosperity, and living standards. This indicates that the US is making GDP progress together in reducing emissions. This could be due to low emissions levels or at least large reductions in emissions to maintain that standard of living. In other words, the US has reduced emissions (even when we correct for trade) whilst increasing GDP. The effects of irrigating land without first comprehending and then considering implications from the interdependent relationships of hydrology, geology, geochemistry, biology, climatology, land use, and socio-economic issues have been documented by Hren and Feltz [17] in their study of irrigation drainage in the Western United States. Selenium is the trace element most frequently detected in high amounts in water, bottom material, and biota, according to investigations finished in 26 different locations. Additionally, higher amounts of boron, arsenic, mercury, and pesticide residues have been discovered in certain areas. Components linked to irrigation drainage frequently bioaccumulate. Demands for food production from marginal, sub-marginal, and newly irrigated soils are likely to have severe negative environmental impacts from the allocation of limited water resources and contamination from irrigation drain water as the world experiences explosive population growth, particularly in poorer countries. Without considering the discharge of pollutants from irrigation water ap-

plication, marginally farmed land is especially prone to degradation from soil erosion, salinization, and waterlogging. The failings of the urban and industrial plans of the late Pres. Ferdinand Marcos and early Pres. Corazon Aquino's years were related to political instability, rapid deforestation, environmental degradation, and on-going explosive population expansion in the Philippines during the 1970s and 1980s [40]. However, the Marcos and Aquino administrations saw a rise in rural poverty and environmental degradation as a result of a lack of industrialization and economic progress [40].

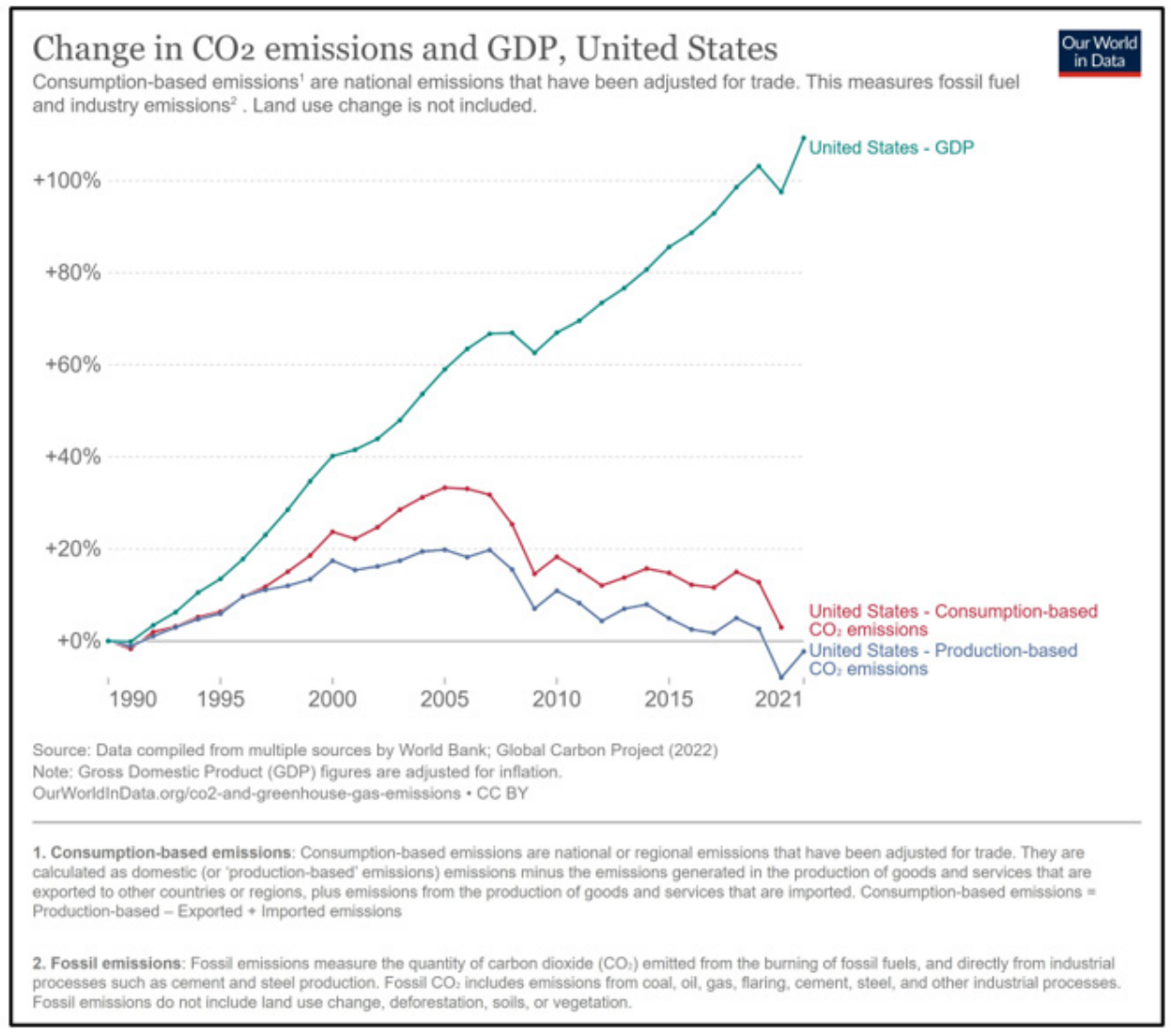


Figure 4: Change in carbon dioxide (CO_2) and gross domestic product (GDP) of the United States from 1990 to 2021. https://ourworldindata.org/co$_2$-and-greenhouse-gas-emissions (Accessed on 14 October 2023).

India: The changes in CO_2 and GDP of the USA from 1990 to 2021 are presented in Figure 5. Clearly, India could not properly manage the reduction of CO_2 emissions whilst increasing GDP, which is always higher than the percentages of CO_2 emissions. The increasing trend of CO_2 emissions is almost in line with the increasing GDP. The Indian city of Delhi was examined by Dayal et al. [10] utilizing the opposing theories of resilience and agglomeration economies. Delhi is a growing system that is evolving because of economic, social, and environmental pressures. They conducted their investigation using the driver-pressure-state-impact-response (DPSIR) framework. Using the statistical stochastic frontier function framework, they calculated the population pressure index (PPI) to gauge the amount of population pressure at the ward level. They then looked at the relationship between the PPI and the indicators of wellbeing and the ecosystem. PPI and indices of poor well-being have some overlap. Even though certain locations' population pressure is not at the limit, they nonethe-

less have terrible environmental conditions. This may have happened because of population development in locations that are unsuitable for human habitation. The levels of well-being might decline as more individuals move out in response to growth and employment opportunities. However, with the right reforms and funding for essential facilities, such substantial welfare losses may be avoided, and the city can continue to play the role of a growth engine.

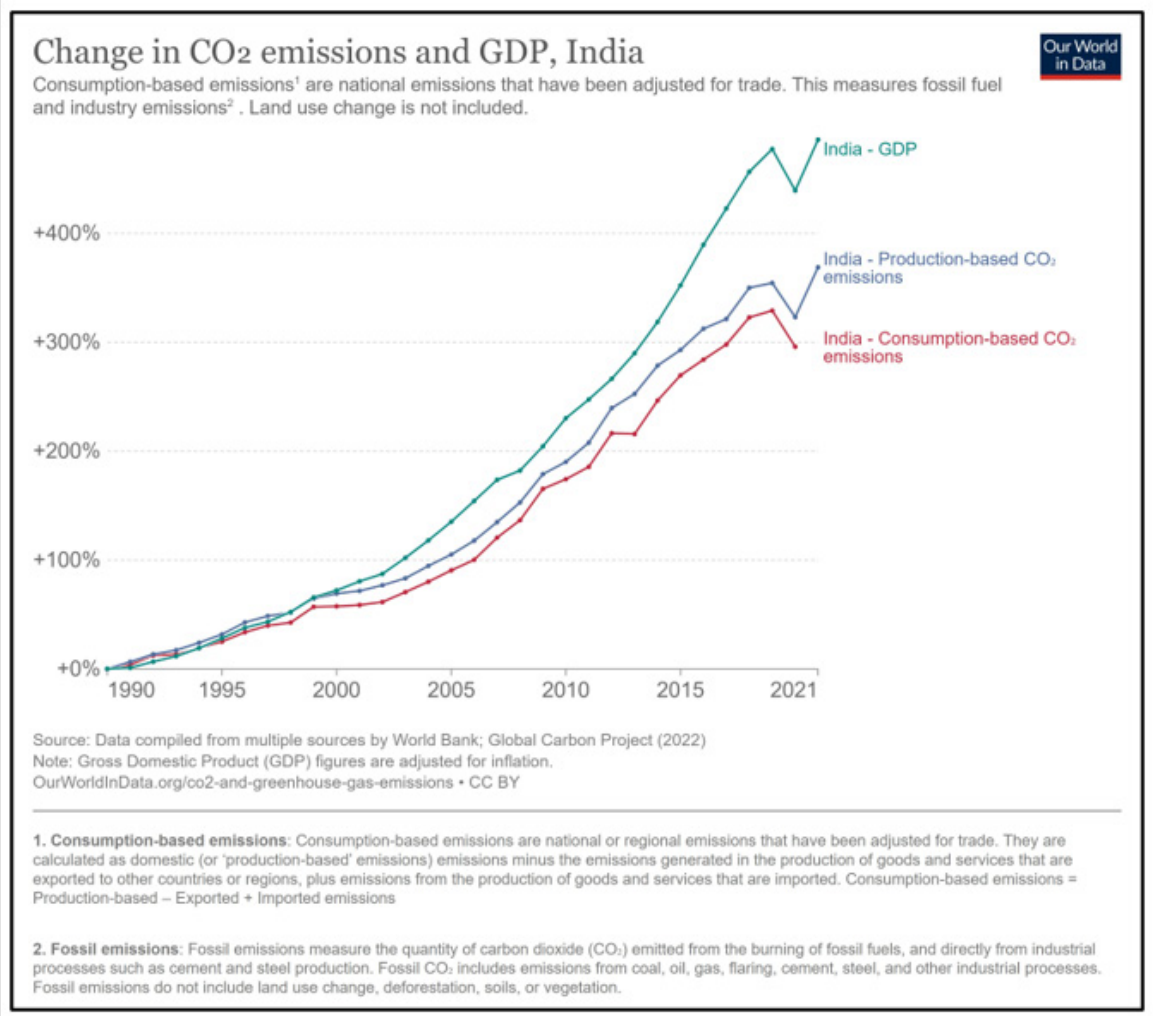


Figure 5: Change in carbon dioxide (CO_2) and gross domestic product (GDP) of the India from 1990 to 2021. https://ourworldindata.org/ co$_2$-and-greenhouse-gas-emissions (Accessed on 14 October 2023).

Africa: The changes in CO_2 and GDP of the Africa from 1990 to 2021 are presented in Figure 6. Clearly, Africa region could not properly manage the reduction of CO_2 emissions since the thread of the CO_2 emissions is increasing higher. However, it is unknown the GDP is not indicated in the graph based on the cited information from Our World of Data. Whether Malthusian or Boserian in character, population and environment arguments about Africa tend to revolve around and/or centred on population numbers as the determining factor underlying the interaction between environment and society, according to Mazzucato and Niemeyer [31]. Instead, they claimed that population levels are less significant than how individuals respond to population growth. They emphasised the function of local informal institutions, such as land tenure systems, as well as the evolution of local networks, norms, and practises in resolving conflicts between people and the environment. Their research was based on observations made during fieldwork in the Sahelian and Sudano-Sahelian regions of Africa between 1995 and 1998, as well as an analysis of colonial records from the region from the first half of the 20th century. They came to the conclusion that changes made to local, informal institutions over the past century have made it possible to manage land sustainably while taking into account the expanding population and diminishing availability of natural resources.

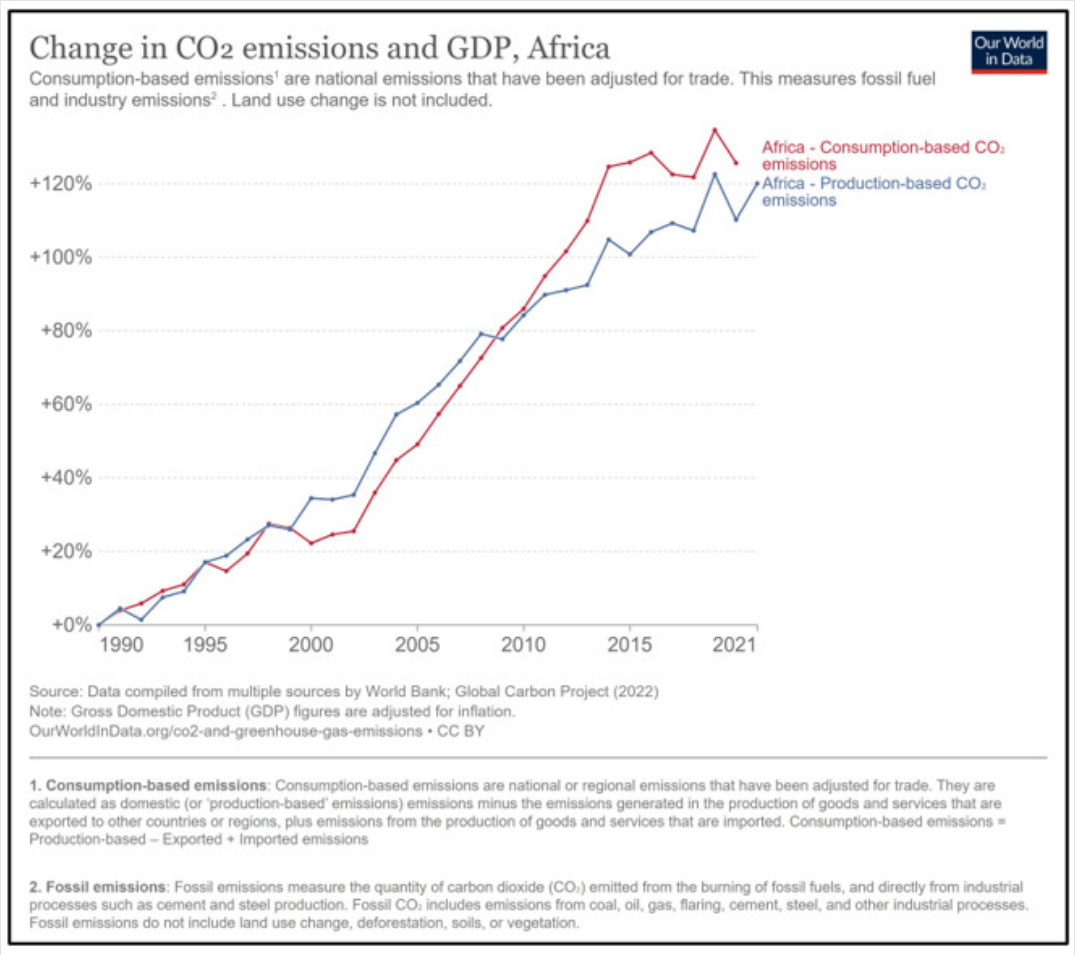


Figure 6: Change in carbon dioxide (CO_2) and gross domestic product (GDP) of the Africa from 1990 to 2021. https://ourworldindata.org/ co_2-and-greenhouse-gas-emissions (Accessed on 14 October 2023).

Kenya: The changes in CO_2 and GDP of the Kenya from 1990 to 2021 are presented in Figure 7. Clearly, Kenya could not properly manage the reduction of CO_2 emissions whilst increasing GDP, which is always lower than the percentages of CO_2 emissions starting 2005. The increasing trend of the CO_2 emissions is almost going in line with the increasing GDP. Nyamwange [33] concentrated on how population increase affected the environment in Kenya. Significant imbalances exist between the size of the people and the ecology due to population growth momentum and widespread poverty. The Wakamba tribesmen of the Eastern Province and the Maasai of the Rift Valley Province provide as examples of how population increase affects the environment. For many generations, the Wakamba and the Maasai had created economic structures that allowed them to support their populations without overusing the region's natural resources. Due to population pressure in the highland zones, families are compelled to go down the ecological gradient into marginal lands in search of a spot to farm. Migrants crowd on pastoralists as they settle in greater numbers, making existence more insecure. Historically, areas used for grazing during the dry season have seen substantial cultivation. This forced pastoralists to use drier plains longer than customary, resulting in overgrazing and subsequent soil degradation and water misuse.

 DOI: 10.26717/BJSTR.2024.55.008685

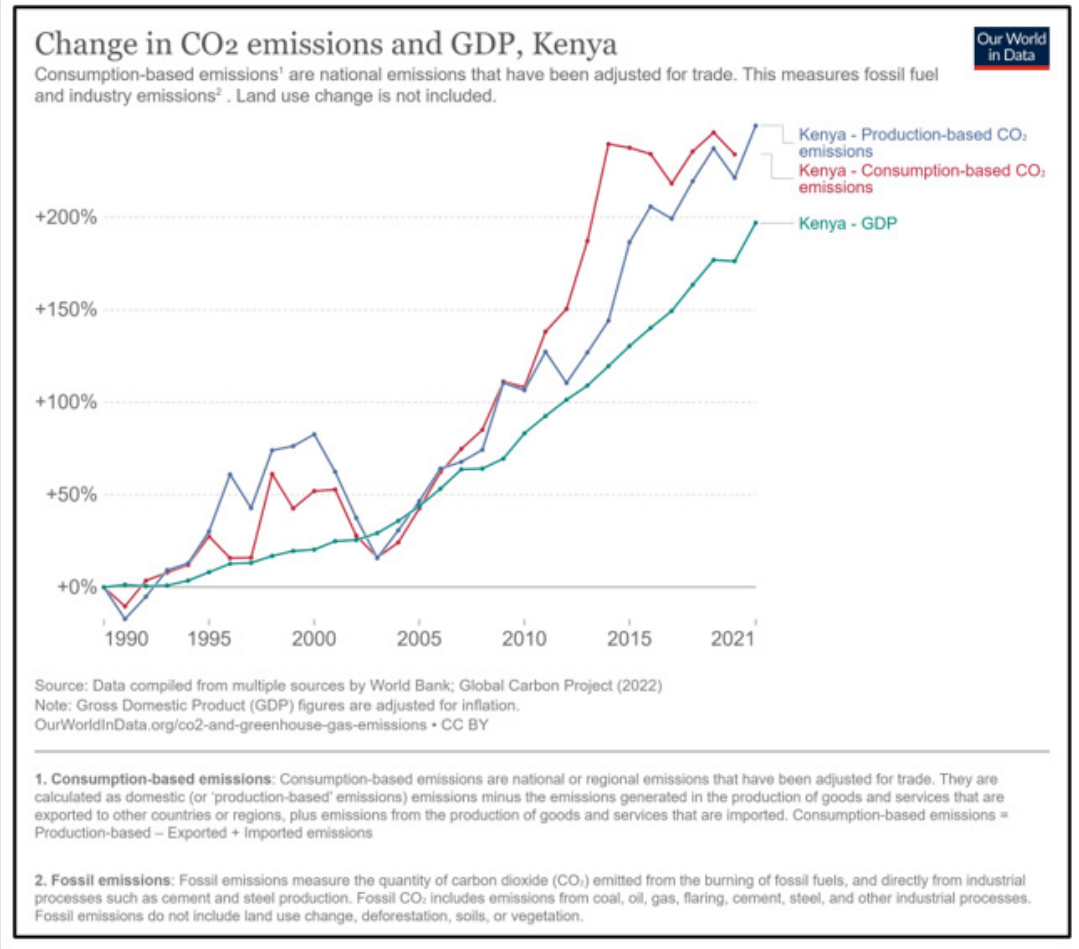


Figure 7: Change in carbon dioxide (CO_2) and gross domestic product (GDP) of the Kenya from 1990 to 2021. https://ourworldindata.org/ co_2-and-greenhouse-gas-emissions (Accessed on 14 October 2023).

Burkina Faso: The changes in CO_2 and GDP of the Burkina Faso from 1990 to 2021 are presented in Figure 8. Clearly, Burkina Faso could not properly manage the reduction of CO_2 emissions whilst increasing GDP, which is always lower than the percentages of CO_2 emissions since 2006. The increasing trend of the CO_2 emissions is almost going in line with the increasing GDP. Burkina Faso has one of the highest population growth rates in the world, increasing by more than 3% a year, according to an analysis by Knauer et al. [20]. Given that Burkina Faso's agricultural output is still very low, this development has implications for food security. The agricultural regions are rapidly growing to make up for the low production. Even using remote sensing photography, it is difficult to chart and monitor this development due to the area's widespread agricultural practices and frequent cloud cover, which make it impossible to distinguish cultivated land from other forms of land cover and land usage. They revealed a 91% increase in agricultural land between 2001 and 2014, up to a total of 116,900 km2. While the majority of this trend's agricultural regions are rain-fed, irrigated fields and plantations have also grown significantly, particularly because of particular development initiatives.

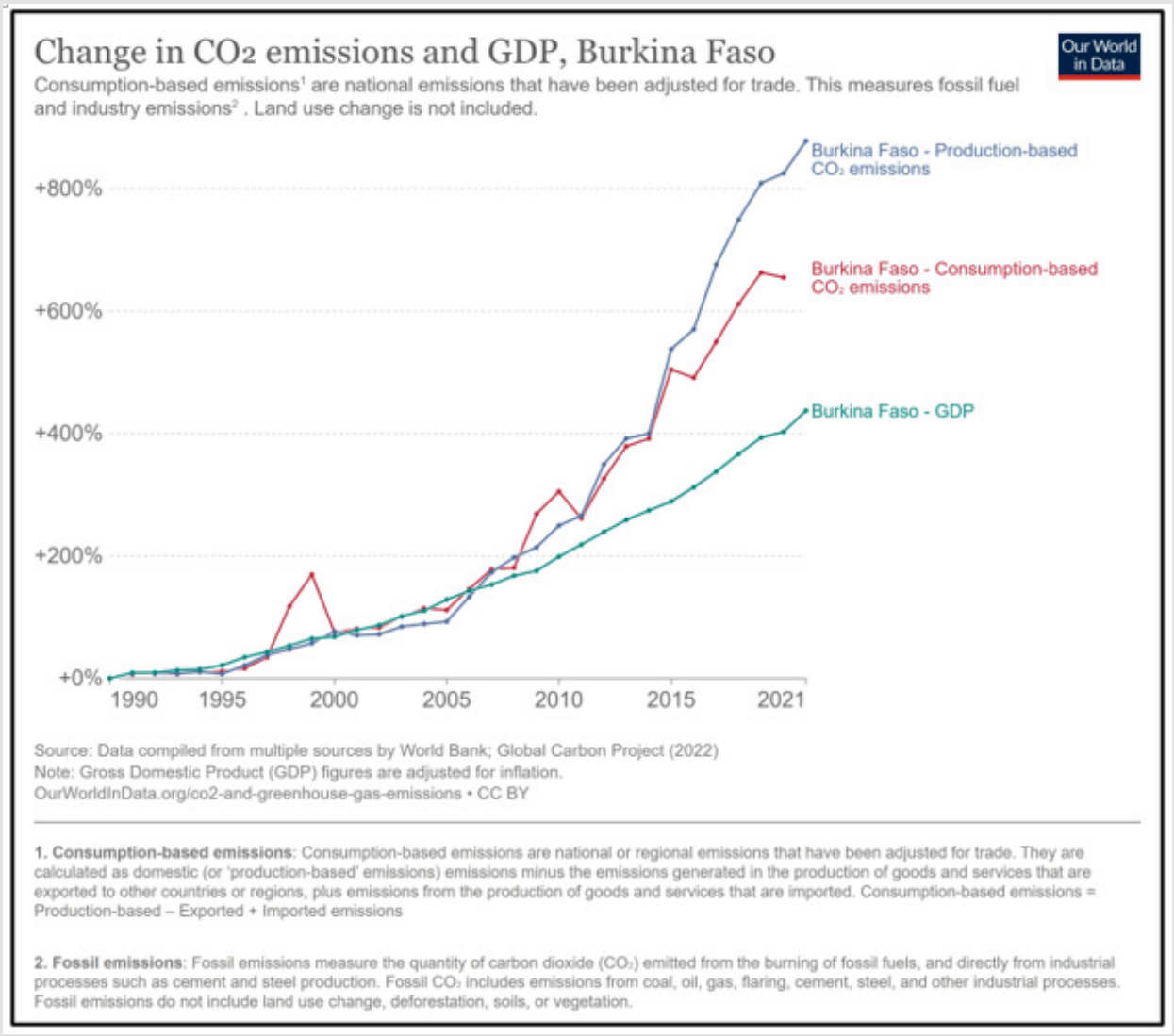


Figure 8: Change in carbon dioxide (CO_2) and gross domestic product (GDP) of Burkina Faso from 1990 to 2021. https://ourworldindata.org/co_2-and-greenhouse-gas-emissions (Accessed on 14 October 2023).

Concluding Remarks

In sum, the following five results can be interpreted as an increase in the human population based on the complete body of literature retrieved from the Scopus database. First and foremost, resource consumption is rising; second, habitat loss and biodiversity loss; third, the environmental stresses due to human activities on ecosystems; fourth, increased waste output; and fifth, climate change is getting worse as a result of rising greenhouse gas emissions. The increase in energy consumption, food demands, transportation needs, and industrial activity are the main contributors to the aforementioned factors. The following two approaches should be considered in management strategies. Examining agricultural requirements should be matched with protected areas for long-term environmental conservation. Second, there are always needs, gaps, and new directions for studying the factors that affect the environment, society, and government that need to be investigated and determined, at the very least, in the near future.

References

1. Ritchie H, Rodés Guirao L, Mathieu E, Gerber M, Ortiz Ospina E, et al. (2023) Population Growth. Published online at Our World in Data org.
2. Hogan DJ (1991) Population growth and the environment. Revista brasileira de estudos de populacao 8(1-2): 61-71.
3. Hogan DJ (1992) The impact of population growth on the physical environment. European Journal of Population 8(2):109-123.

4. Barbat WN (1973) Interrelations of population growth, energy supply, and environment. American Association of Petroleum Geologists Bulletin 57(11): 2169-2194.
5. Bartlett AA (1994) Reflections on sustainability, population growth, and the environment. Population and Environment 16(1): 5-35.
6. Bartlett AA (1997) Reflections on sustainability, population growth, and the environment. Revisited. Renewable Resources Journal 15(4): 6-23.
7. Bartlett AA (2006) Reflections on sustainability, population growth, and the environment-2006. The Future of Sustainability, pp. 17-37.
8. Caldwell JC, Caldwell P (1994) Rapid Population Growth and Fragile Environments: The Sub-Saharan African and South Asian Experience. Annals of the New York Academy of Sciences 709 (1): 355-369.
9. Daily G, Dasgupta P, Bolin B, Crosson, P, Du Guerny J, et al. (1998) Food production, population growth, and the environment. Science 281(5381): 1291-1292.
10. Dayal V, Kapuria P, Mitra A (2011) Population pressure and environment in the context of growth: Evidence from an indian city. International Journal of Urban Sustainable Development 3(2): 168-184.
11. Dimitrov B, El Saidi MA, Khalil Z (1998) Overall population growth in periodic environment. Environmetrics 9(3): 317-328.
12. Estall RC (1972) Population Growth and Environment: Some Aspects of the Problem in the United States and the Response. Journal of American Studies 6(1): 55-68.
13. Fuggle RF (1978) Population growth and the environment. Transactions of the Royal Society of South Africa 43(1): 33-36.
14. Gerhard O (1993) Energy demand, the environment, and population growth. Siemens review 60(2): 34-37.
15. Hawthorn G (1973) Does population growth threaten the natural environment. Nature Focus 16: 3-6.
16. Holl KD, Daily GC, Daily SC, Ehrlich PR, Bassin S (1999) Knowledge of and attitudes toward population growth and the environment: University students in Costa Rica and the United States. Environmental Conservation 26(1): 66-74.
17. Hren J, Feltz HR (1998) Effects of irrigation on the environment of selected areas of the Western United States and implications to world population growth and food production. Journal of Environmental Management 52(4): 353-360.
18. Jolly R (1993) UNICEF policy and perspectives: child survival, population growth, environment and development. Transactions of the Royal Society of Tropical Medicine and Hygiene 87: 32-35.
19. Keyfitz N (1996) Population Growth, Development and the Environment. Population Studies 50(3): 335-359.
20. Knauer K, Gessner U, Fensholt R, Forkuor G, Kuenzer C (2017) Monitoring agricultural expansion in Burkina Faso over 14 years with 30 m resolution time series: The role of population growth and implications for the environment. Remote Sensing 9(2): 132.
21. Kussell E, Leibler S (2005) Ecology: Phenotypic diversity, population growth, and information in fluctuating environments. Science 309(5743): 2075-2078.
22. Laakso J, Kaitala V, Ranta E (2006) Population dynamic consequences of adaptive growth rate in fluctuating environment. Ecological Modelling 194(1-3 SPEC. ISS.): 132-140.
23. Legrand T (1998) Global population growth and the environment: a review of the issues. Association des démographes du Québec 27(2): 221-252.
24. Lehmijoki U, Palokangas T (2010) Trade, population growth, and the environment in developing countries. Journal of Population Economics 23(4): 1351-1370.
25. Lewontin RC, Cohen D (1969) On population growth in a randomly varying environment. Proceedings of the National Academy of Sciences of the United States of America 62(4): 1056-1060.
26. Li Y, Niu S, Ma L, Luo G (2011) Chinese population, growth, and the environment: A new analysis. 2011 International Conference on Remote Sensing, Environment and Transportation Engineering, pp. 5802-5805.
27. Liu J, Hu S, Liu X (2001) The environment pollution and endogenous population growth. Journal Huazhong (Central China) University of Science and Technology 29(10): 110-111.
28. Liu X, Levy T, Chao CC, Zhang M (2017) Is population growth bad for the environment? B.E. Journal of Economic Analysis and Policy 17(3): 20160210.
29. Mallick S, Ghani N (2005) A review of the relationship between poverty, population growth and environment. Pakistan Development Review 44(4 PART II): 597-613.
30. Mao (1991) Study on coordinating development of economic and social growth with population, resources and environment at county level. Acta Geographica Sinica 46(4): 385-395.
31. Mazzucato V, Niemeijer D (2002) Population growth and the environment in Africa: Local informal institutions, the missing link. Economic Geography 78(2): 171-193.
32. Mortimore M, Tiffen M (1994) Population growth and a sustainable environment. Environment 36(8): 10-32.
33. Nyamwange M (1994) Kenyan population growth and its impact on the environment. Papers & Proceedings of Applied Geography Conferences - State University of New York at Binghamton 17: 143-147.
34. Peacock S H (2018) Effect of ecosystem literacy on understanding the impact of human population growth on the environment - A multiple case study. Ecopsychology 10(3): 181-188.
35. Scherr S J (1997) People and environment: What is the relationship between exploitation of natural resources and population growth in the south? Forum for Development Studies 24(1): 33-58.
36. Searle R (2006) Population growth, resource consumption, and the environment: Seeking a common vision for a troubled world. Population Growth, Resource Consumption, and the Environment: Seeking a Common Vision for a Troubled World, pp. 1-112.
37. Singh V P, Khedun C P, Mishra A K (2014) Water environment, energy, and population growth: Implications for water sustainability under climate change. Journal of Hydrologic Engineering 19(4): 667-673.
38. Smith R H, Mead R (1975) A note on population growth in a variable environment. Oecologia 20(4): 333-337.
39. Tiffen, M, Mortimore M (1992) Environment, Population Growth and Productivity in Kenya: A Case Study of Machakos District. Development Policy Review 10(4): 359-387.
40. Urich PB (1998) Could industrialisation and economic growth lead to sustainable environments? Land tenure, population and migration issues in the Philippines. Development Bulletin of the Australian Development Studies Network (45): 52-54.
41. Weber H, Sciubba JD (2018) The Effect of Population Growth on the Environment: Evidence from European Regions. European Journal of Population, p. 1-24.
42. Yu YG, Zhang SC, Yang DL (2006) The analysis of model on population

growth with stage-structure in the polluted environment. Acta Mathematicae Applicatae Sinica 22(2): 265-272.

43. Zhao J (1997) Analysis of the impact of population growth in Henan province on its environment and ecosystem. Chinese journal of population science 9(4): 363-373.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2024.55.008685

Chee Kong Yap. Biomed J Sci & Tech Res

Submission Link: https://biomedres.us/submit-manuscript.php