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# HARMONIZING ECONOMIC GROWTH AND ENVIRONMENTAL PRESERVATION: DECOUPLING POLLUTION FROM PROSPERITY

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## Abstract

*Environmental pollution and climate change effects being experienced by present global populations can be attributed to economic growth. With the increase in industrialization, the generation of waste without proper treatment and disposal has resulted in polluted air that risks the health of the population. It has also resulted in increased global earth temperatures, which have in turn affected the agricultural productivity of the earth, a primary source of livelihood for human populations. Despite these great consequences, there can be a harmonious existence of economic growth and reduced environmental pollution through decoupling. Government efforts are critical in the implementation of decoupling efforts, with their commitments expressed through policies and legislation.*

**Keywords**

Environmental Degradation, Pollution, Decoupling, Economic Growth, Climate Change

## 1. Introduction

Human populations depend on clean environments for optimum living conditions. Where pollution exists the quality of life is compromised. Climate change fueled by environmental degradation can be linked to the global health burden, as environmental ecosystems are responsible for the food we eat and the water we consume. Unsafe water results in inadequate sanitation and hygiene, contributing to health issues that drive morbidity rates high, and affect economic productivity within the affected zones. Polluted air is harmful to plants, animal, and human life as it threatens the efficiency of respiratory systems, increasing morbidity. These effects are more nuanced for communities living in low-income zones where pollution is rampant, and higher climate vulnerability exists. The connection between economic growth and clean environments is crucial to explore, to ensure that the balance is not compromised, affecting human, animal and plant life that sustains the earth. Consequently, linking human activity to environmental degradation is crucial in promoting sustainability to reduce climate change effects of rising seas, global warming, and increased frequencies of environmental disasters.

## 2. Economics Risk

Climate change not only affects the visible temperature and precipitation aspects but also poses a risk to the economic outputs of global populations. According to Mikhaylov et al. (2020) increasing temperatures have been attributed to the industrial revolution that began in the $18^{th}$ century, resulting in high manufacturing and economic activities that have resulted in increased greenhouse gas emissions. These gases include carbon monoxide, ozone, and methane which account for what is commonly referred to as the greenhouse gas effect, which has resulted in a steady increase in the earth's temperature of between 1.5-1 $^0$C in the past 100 years and has been projected to increase to above $1^0$C by 2050 (Mikhaylov et al., 2020). Continued use of combustible minerals in industries like coal and natural gas, transportation emissions, deforestation and forest fires will continue exacerbating the greenhouse gases emitted and their effect on the earth's temperatures.

A result of increasing temperatures has been recorded in disruptions of water security and worsened human health. Polar ice has been recorded to be melting at a faster rate compared to pre-industrial times, resulting in rising sea water levels. As a consequence, coastal regions are now being inundated due to rising sea levels, which affects coastal populations and their ability to utilize arable lands for agriculture, impacting food security. Anderson et al. (2020) state that high

temperatures reduce snow periods, translating to overdried soils that are unsuitable for agriculture. In addition, dry soil cannot support tree growth, resulting in higher evaporation rates in the oceans. Compounded, the greenhouse gas effect affects the food, water, and general security of the global population (Mikhaylov et al., 2020).

Population increase also pushes the climate change effect, reducing available land for agriculture or forests. The land is an asset to poor populations across different continents, which they use to generate sources of income, and therefore, continued degradation worsens their already dire economic situations (Barbier & Hochard, 2018). Secondly, higher population concentrations in cities have increased the generation of greenhouse gases, which have affected the respiratory health of the populations. According to Shaddick et al. (2020), annually, fine particulate matter air pollution accounts for 4.2 million deaths, most of which are from households, industry, transport and waste. In addition, Shaddick et al. (2020) state that low-income and middle-income societies are most affected by respiratory complications arising from this pollution, increasing the urgency of addressing air pollution in cities and other highly concentrated regions.

In addition to air pollution, population increase has resulted in land degradation. According to Eswaran et al. (2019), presently, only about 3% of the global land surface is classified as prime for agricultural productivity, which should feed the increasing population of more than 7.6 billion people on earth. Land degradation results in reduced productivity of land due to erosion that scraps off the fertile soil layer, depositing the sediments in areas not suitable for agriculture like water reservoirs. Economic losses due to degradation are linked to reduced agronomical outputs from previously arable land, as well as reduced areas for agricultural practice. It has been quantified that soil erosion and desertification have resulted in a 50% reduction in land productivity globally, with Africa's loss due to soil erosion being quantified to between 8-40% (Eswaran et al., 2019).

An extended effect of climate change as a consequence of greenhouse gas effect and land degradation is droughts. Globally, the frequency and intensity of droughts in increasing. The high temperatures as a result of greenhouse gases increase aridity in dryland areas and have severe effects on the precipitation patterns, which drive the occurrence of droughts (Hermans & McLeman, 2021). Droughts affect livelihoods by affecting terrestrial ecosystems like plant growth and elemental biochemical cycles, especially the sensitive soil carbon(C) and nitrogen(N) cycles. According to Deng et al. (2021), decreased carbon and nitrogen contents due to droughts affect

photosynthesis, reducing crop output and increasing the atmospheric carbon dioxide content, advancing the greenhouse gas effects.

In addition to droughts, another effect of climate change is flooding which affects crop growth patterns. According to Nguyen et al. (2018), flooding affects the soil's abiotic and biotic properties, reducing soil productivity. For communities living along coastal and riverine regions, flooding events have huge negative effects on their well-being, as well as economic outputs. Poor populations, especially in slum areas located in these regions are more affected by flooding, because their incomes are directly affected by the weather, in addition to housing that is less protected during such events (Bangalore et al., 2019). The poverty-vulnerability relationship explored by Bangalore et al. (2019) states that poor people take longer to recover from flooding events due to inaccessibility to insurance, borrowing, and inadequate governmental support. This effect calls on deliberate efforts to address climate change to better the welfare of poor populations.

Livestock growth and productivity are also negatively affected by climate change. The direct effect is on their health, growth and reproduction, while indirect effects are due to climate change effects on pastures and crop feeds. According to Cheng et al. (2022), livestock products account for 33% of global protein consumption and create substantial employment opportunities for rural and poor households, boosting nutritional security. Since livestock rely on crop yields for their nutrition, and when the crop yield output is reduced, they do not feed properly, affecting their productivity of products like meat. Cheng et al. (2022) also state that population and income growth, merged with global urbanization have increased the demand for livestock products, and the pressures exerted by climate change are affecting the productivity of the sector. Livestock perform at optimum temperature and humidity levels, which the increasing temperatures have altered, resulting in more energy spent on thermoregulation than production (Wreford & Topp, 2020). In addition, livestock production is a leading cause of greenhouse gas emissions from agriculture, and therefore, establishing a balance between productivity and environmental sustainability is an issue that requires attention from all stakeholders.

Furthermore, climate change is affecting the available underground water resources. Droughts and land degradation have resulted in overdrawing of groundwater for farming and livestock production, increasing the vulnerability of other ecosystems that depend on underground water sources. Schilling et al. (2020) state that the increased earth temperatures have resulted in more evaporation of water from soils, rendering soils unproductive, and depleting underground

water resources. Some underground water resources are on the verge of diminishing, especially those that supply cities directly, causing water stress. Schilling et al. (2020) therefore advise that population increase is increasing water demand, and projects future depletion of water resources globally if mitigation measures are not implemented urgently.

## 3. Economic Growth and the Environment

Economic growth has been associated with negative impacts on environmental sustainability and the general well-being of ecosystems. Historically, industrialization and economic development have clashed with environmental protection entities (Mu et al., 2019). Industries have and continue to rely on energy sources to drive economic growth. The energy is sourced from mineral and water resources that keep declining. Tariq & Aisha (2020) state that exploitation of these resources has been attributed to increasing carbon emissions and other pollutants to the environment. Economic growth has boosted human development, but increased energy consumption, which has driven high demand for fossil fuels. As a result, more environmental pollution is experienced. Tariq & Aisha (2020) highlight that poor economies experience climate change consequences more, especially since their economic outputs are reliant on weather conditions. The increased temperatures negatively affect populations whose economic contribution is largely outdoors, while droughts affect agricultural yields.

Population growth sparked by increased industrialization has also strained the environment due to increased demand for raw materials to sustain the development of these populations. According to Li et al. (2018), the demand for raw materials has driven production costs higher and increased the amount of waste materials generated by the production processes, which negatively affects the environment through increased pollution. There is also more reliance on construction and transportation, which has increased reliance on fossil fuels and materials that are harmful to the environment. According to Li et al. (2018), pollutants like heavy metals and benzopyrene are threats to humans due to their toxicity and carcinogenicity. When pollutants interact with water sources through surface runoff or direct dumping, aquatic life is affected in the long term, as most of them are never removed from these systems. Li et al. (2018) highlights that human consumption of polluted water or interaction with it compromises their health, resulting in high medical costs. Environmental protection is therefore essential in addressing some of these challenges that surface due to increased population for long-term sustainability.

Despite the increased dependency on energy resources and negative impacts on the environment, economic growth could embrace sustainability by using sustainable energy developments. According to Mu et al. (2019), sustainable energy development is presently a goal of many countries that seek to promote energy equity, energy security and energy environmental sustainability. Debates on environmental sustainability and economic growth have given rise to strategies referred to as decoupling (relative or absolute). Soliman et al. (2023) explain that decoupling refers to the process of disentangling industrial growth from emissions levels initially associated with it. According to Soliman et al. (2023), decoupling efforts are designated to each country responsible for the emissions and seek to reduce the annual emission levels during economic production, consequently reducing the negative environmental toll.

Relative decoupling translates to faster economic growth compared to the growth of environmental damage or use of resources (Vadén et al., 2020). This means that there is still growth in environmental damage and resource use but at much lower rates compared to the amount of economic growth reported at the same time. This is applied in areas where environmental damage is unavoidable, so the rate of growth of the impacts can be slowed down, without it ever turning to absolute decoupling, as economic growth would be stalled.

On the other hand, Vadén et al. (2020) state that absolute decoupling is associated with increased economic growth that has reduced resource use or environmental impacts. This type of decoupling is considered strong compared to weaker relative decoupling. Mikayilov et al. (2018) highlight that compared to relative decoupling, absolute decoupling should be the primary goal of any nation, stating that the GDPs of the countries will grow, while environmental impacts will reduce over time. To achieve this, Mikayilov et al. (2018) advise that the comparison of greenhouse gas emissions to GDP growth on year-to-year patterns is essential to ensure a reduction in the direct effect of economic growth. The Organisation for Economic Co-operation and Development (OECD) states that as of 2020, in member countries, only sulfur oxide($So_x$) emissions had achieved absolute decoupling, while the rest of greenhouse gas emissions have achieved relative decoupling.

Ward et al. (2016) state that most nations have at best achieved temporary decoupling, as permanent decoupling is impossible since for essential and non-substitutable resources, physical limits govern the attainment of efficiency gains. There have been fueled discussions around absolute and relative decoupling, and the long-term sustainability of measures put in place by

different nationalities to address environmental protection. From these discussions, there have been strides taken by different governments to implement decoupling and push environmental protection.

**4. Government Policy for Sustainability**

To begin with, the European Union has championed environmental protection and conservation measures through the European Green Deal. Established in 2019, the deal seeks to transform the European Union economies into resource-efficient economies. Some of the objectives of the deal include working to ensure no net emissions of greenhouse gasses by 2050, economic growth completely decoupled from resource use and ensuring that no one is left behind (European Commission, 2019). The deal focuses on different sectors like industries, agriculture, transport, energy, research, water resources and finance, and combines them with environmental conservation. By adopting clean air for the population, the policy on cleaner ambient air by 2030 seeks to embrace WHO guidelines in advancing to zero air pollution. This will be achieved by revising existing policies and guidelines across the European Union and determining measures that ensure the achievement of set standards (Jahnz & Dreux, 2024).

In addition, the deal pushes for regular monitoring of policies in places that target decoupling. Through this monitoring, the policies will be updated, and progress made compared against set targets. The progress will highlight the areas with deficits to be concentrated on and areas where goals are achieved. This then pushes the discussion on permanent decoupling. The responsibilities of each of the 27 member states in monitoring and reporting are stipulated in the deal. One such responsibility in the transport sector is ensuring that all new cars and vans registered in Europe are zero-emissions by 2035 (European Commission, 2019). By ensuring collaboration with infrastructure hubs, governments are expected to supply citizens with infrastructure that drives them towards achieving the zero-emission goal by 2050.

Pollution prevention (P2) is another initiative that targets sustainability and decoupling. Championed by the United States Environmental and Protection Authority (EPA), it is a framework that seeks to reduce, eliminate and prevent pollution at source before recycling, treatment or disposal takes place. In the construction sector, for example, the framework targets embodied carbon from the extraction, production, transport and manufacturing stages of economic growth (USEPA & OCSPP, 2023). By tracking, quantifying and reducing embodied carbon emissions from the construction centers, the authority in collaboration with stakeholders seeks to

reduce the greenhouse gas emissions recorded annually. This process allows for the use, salvaging and reuse of low-carbon materials that minimize wastage and disruption of natural ecosystems in construction sites through greenhouse gas emissions.

There has also been an improvement in the management of Municipal Solid Waste (MSW) to reduce the impact of plastics on the environment. Tsiamis et al. (2018) state that with the increase in population, plastic use and disposal have increased, which has resulted in more affluent nations developing strategies to curb plastic disposal in municipal waste. In Europe for example, recycling initiatives have been successful due to stakeholder commitment to policy implementation, regulation and tax penalties (Tsiamis et al., 2018). Tsiamis et al. (2018) claim that socioeconomic affluence results in reduced plastic pollution, a claim that Thushari & Senevirathna (2020) confirmed in their study of coastal areas. According to this research, unsustainable developments in poor to low-income areas, especially around mangrove areas are a threat to marine ecosystems due to uncontrolled municipal waste dumped into the oceans. Therefore, governments and relevant stakeholders need to develop strategies that embrace all socioeconomic levels of their populations for effective decoupling.

In ensuring that air pollution is tackled, the Pollution Prevention Act(PPA Act) of 1990 pushes for air pollution prevention at the source. By ensuring that the reduction of waste at the source is more desirable than pollution or management control, the act pushes industries, governments and the public to chase compliance and escape regulatory consequences like fines and closures (USEPA & OCSPP, 2023). In addition, the act pushes for the implementation of equipment modifications and improved technology to improve pollution mitigation. Zeng et al. (2019) highlight that through the implementation and thorough inspections powered by this act, the state shut down industries with obsolete technology, only allowing them back to production when they met the set standards of operation.

## 5. Conclusion

In conclusion, human life and its sustainability is directly tied to the environment, and the pollution thereof poses a risk to the well-being of global populations. Large-scale pollution was first recorded during the onset of industrialization, and with continued industrialization, the scale of production increased. The effects of this pollution have been quantified and span across different sectors. Economic growth is directly linked to pollution, and consequently, climate change. The elements of climate change including rising temperatures and altered precipitation

have resulted in extreme weather events like floods and droughts, which in turn affect the productivity of land, a resource most depended on by human populations for economic growth. The poor and low-income populations have more climate change vulnerability, as their economic contribution is dependent on the weather. Therefore, tackling climate change is a core responsibility of governments and stakeholders globally. By implementing environmental decoupling (relative or absolute) on industrialization and economic growth, governments are attempting to reduce the harsh reality of climate change, especially on their vulnerable populations. Strides have been made across Europe and the United States, owing to stakeholder commitment and understanding of climate change impacts, and the same can be replicated in other economies.

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