

# Industrialization and the Green Economy: Great Dilemma towards Achieving Sustainable Development of the Less Developed Countries (LDCs)

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## Abstract

The quest to preserve and protect the world environment has become our new reality in the world today. This has brought about the pursuit of what is now known as “sustainable development”; development achieved and the natural environment equally preserved. No doubt, the environment has absorptive/assimilative capacity which enables it degrade wastes discharged into it without affecting its quality, but there is a quantity and quality of wastes it can easily degrade. The less developed countries (LDCs) are always faced with economic pressures which make them pursue the type of industrial and economic activities that generate much wastes beyond the assimilative capacity of the environment, hence degrade the quality of the natural environment. The great dilemma now becomes either to preserve the quality of the environment at the expense of their economic growth and development, or pursue economic growth and development, through industrialization, at the expense of the environmental life and quality. This dilemma can be tinkered with, as posited by this paper, by having a trade-off between industrialization and environmental quality to establish equilibrium. This point of equilibrium is known as the “**ecological threshold**” point which can be enhanced through technological advancement to accommodate more industrial activities without causing harm on the environment. Thus, the LDCs can achieve their needed economic growth and development and the natural environment equally preserved.

## 1.0 Introduction

The advent of the industrial revolution in the 18<sup>th</sup> century that started in Great Britain, spreading across other countries in Europe, America and Asia, sets the world on an entire new course in terms of industrial activities. Countries saw their economies turned around in a record time; moving from poverty to prosperity. Since then, the adoption of industrialization as a policy has continued to dominate discussions among international summits and communities. Industrialization has been considered as the sure route to economic emancipation, growth, and development of the LDCs across the globe. Many LDCs have come to embrace the policy of industrialization as a means of achieving their general objectives of national economic growth and development.

However, industrialization has never come without any cost on both the society and the natural environment. Industrial activities have been considered as the major generator of wastes, pollutions, and effluents, which affect the natural condition of the environment and threaten the existence of humans. This, has therefore, attracted reactions from international organizations such as the United Nations (UN), countries of the world: the more developed countries (MDCs), on the negative impacts of the ever increasing industrial activities on the natural environment. The debate has always centered on either to control the rate at which countries (LDCs) pursue industrialization to attain economic growth at the expense of the environment, or preserve the natural environment at the expense of the development of those countries.

## 2.0 Industrialization and the Green Economy Conceptualized

**Industrialization** can be seen as the period of social and economic change that transforms a human group from the agrarian society into an industrial one, involving the extensive reorganization of an economy for the purpose of manufacturing (Steven, 2003). Industrialization is associated with mechanization where human efforts are replaced with machines, and mechanized mass production of goods is made possible. It can also be referred to as the process in which a society or country transforms itself from a primarily agricultural society into one based on the manufacturing of goods and services (Roberts, 2002).

Therefore, a country is considered industrialized if such country has moved from agriculturally based to manufacturing based economy with the use of mechanized equipment thereby increasing output. Also, an industrialized country is such that has adopted the use of sophisticated technological equipment in the production of goods and services other than labour power, whereby the economy records tremendous increase in goods and services (Kalu, 2009).

**The green economy** is an initiative of the United Nations Environmental Programme (UNEP) which is geared towards the preservation of the natural environment as countries pursue economic growth. A working definition developed by UNEP considers the green economy as one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, 2002). From the definition, the green economy can be thought to be an economy with low carbon, resource efficient and socially

inclusive. Thus, a green economy is such economy whose growth is totally driven by both public and private investments and economic activities that reduce the rate of carbon emissions and pollutions, improve energy and resource efficiencies, and preserve biodiversity and the ecosystem (Richard, 2011).

According to UNEP (2002), the Green Economy Initiative (GEI) includes three sets of activities:

- Promoting the Green Economy Report and related research materials, which will analyze the macroeconomic, sustainability, and poverty reduction implications of green investment in a range of sectors; from renewable energy to sustainable agriculture, and providing guidance on policies that can catalyze increased investment in these sectors;
- Providing advisory services on ways to move towards a green economy in specific countries; and
- Engaging a wide range of research non-governmental organizations, businesses and UN partners in implementing the GEI.

### **3.0 Industrialization and Economic Development**

Industrialization has proved over time to be a critical factor in driving economic development (Tom-Ekeni, 2008). Economic development in this context is referred to an upward trend move of the entire social system, and such structural and holistic changes that positively contribute directly or indirectly to the welfare of the entire populace. According to Todaro (1981), development in a holistic sense should touch every aspect of the social system; it can be viewed as moves away from a condition of life widely perceived as unsatisfactory and toward a situation or condition of life regarded as materially and spiritually 'better'. Economic development captures reduction in poverty level, reduction in the level of inequality, reduction in unemployment rate, increase in per capita income level, low morality rate, and entire increase in the standard of living of the people.

Industrialization is associated with increase in economic activities which equally culminate to economic growth and development on the long run. Through increased industrial activities, employment opportunities are generated in both small and large industries. The industrial sectors, through backward and forward linkages with the other sectors of the economy, absorb underemployment and unemployed workers in the system. Employed workers receive incomes which in turn are used to purchase goods and services. Mass production, associated with industrialization leads to fall in the prices of goods and services. This affords the poor the opportunity and the ability to buy both necessary and some luxury goods; raising their standard of living. Also, the working population will have the capacity to save some portion of their income which serves as funds for investment to the investors thereby adding to capital formation in the economy.

Industries periodically pay taxes to the government for carrying out their operations in the country. These serve as revenue to the government through which it can provide infrastructures within the economy. These social amenities will enhance the living standard of the people and equally serve as an enabling environment for business activities to thrive in the country, thereby resulting to more revenue to the government, more infrastructures being provided, and higher living standard for the people; and the cycle continues. These, no doubt, lead to economic growth and development.

Also, industrialization leads to economic stabilization. This is because industrialization, to a great extent, helps control the issue of incessant fluctuations of general prices, leading to the stabilization of the economy. Industrialization which is characterized by mass mechanized production increases the gross domestic product (GDP) of a country. High GDP increases per capita income of the people in a country. Per capita income (income per individual) ideally depicts the welfare level of the people in a country, meaning that high per capita income means high welfare level for the people.

Industrialization also brings about structural changes in the pattern of foreign trade of a country. It helps in increasing the export of the manufactured goods and thus, foreign exchange earnings are made possible. As raw products are processed and transformed in the country, it adds value to locally made products thereby reducing the level of importation of foreign goods into the country, hence improve the balance of payments (BOP) of the country.

### **4.0 Relationship Between Industrialization and The Green Economy**

There is always an interaction between industrialization and the green economy. The natural environment makes available various raw materials such as land, timbers, minerals, water, and etc., as inputs for the industrial sector for the sector; residuals are generated, commonly known as production wastes. These wastes are not adequately managed or transformed, especially in LDCs, and they end up being discharged into the environment thereby affecting the absorptive capacity of the environment and degrading it. While the environment enhances industrial activities and industrialization, industrialization on the other hand diminishes the quality of the environment.

It is important to know that the environment has some natural organisms and mechanisms that have the ability to degrade wastes deposited into it. This ability of the environment to degrade wastes is known as absorptive or assimilative capacity (Ajie et al, 2011). However, this assimilative capacity of natural environment is not unlimited. This means that there is a rate and a quality of wastes which the environment can comfortably

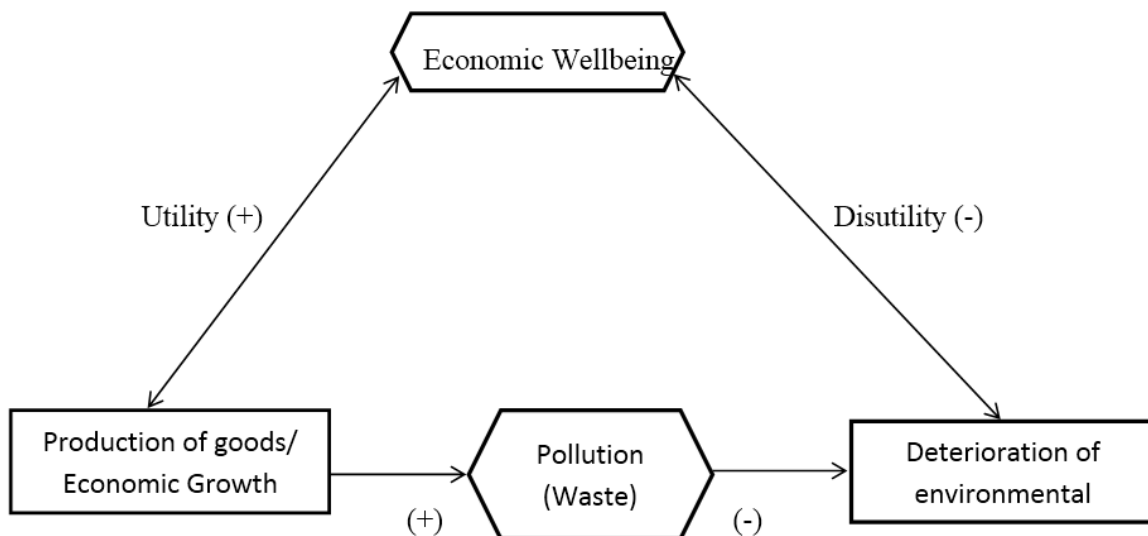
degrade and transform in order to absorb them. Any waste that exceeds the rate or volume and quality which the environment can absorb becomes a threat to the environment and the green economy at large.

It is always observed that the rate of industrial activities and industrialization in many countries of the world, especially the LDCs, have always mounted pressure on the environment (World Bank, 2000, 2001); bringing a collapse of the absorptive capacity of the natural environment, hence the breakdown of the green economy. Many LDCs pursue industrialization and extensive use of natural resources without understudying and understanding the impact of such activities on the natural environment on which such activities are carried out.

Many LDCs that have come to realize the reality of the negative impact of industrialization on the green economy have put up some policy measures to mitigate and salvage the ugly situation. However, most of these policies are not implemented to the latter. The industrial sector is mostly dominated by multinational companies who have the financial power to influence the full actualization of any policy that will affect the level of their activities. Hence, they violate the supposed environmental laws that will little or no penalty, thereby destroying the life of the green economy.

A perfect example is the case of Nigeria. Nigeria has an industrial sector that generates high volume of waste in the country, especially the oil sector. Over the years, there have been cases of uncontrolled gas flaring, incessant oil spillages on our land and rivers, constant deforestation for expansion or construction of new industries or industrial plants, discharge of toxic materials and carbon dioxide on farm lands and atmosphere respectively, to mention, a few, in the country. The country has mapped out measures to help control the level of these harmful activities of the industrial sector with little or no result; rather these activities continue to increase with time. This is as a result of the fact that most of the industries and companies are multinational firms with robust financial base, influencing decisions and regulations that affect their activities, thereby violating the regulatory measures put in place by government.

No, doubt, these industries generate huge revenue for the government and contribute enormously to economic growth (GDP) of the country, but they have little or no concern for the local environment where they operate. One may begin to wonder if we continue to record high GDP growth and amass huge revenue while the natural environment suffer, what will become the future of the country when the green economy can best be explained from the figure below.



**Figure 1:** The Relationship between Industrialization and the Green Economy

An economic activity (production of goods and services) is expected to generate utility (economic wellbeing) when it is eventually consumed by households. At the same time, given that pollution is an undesirable by-product of production activities, household's economic wellbeing would be negatively impacted due to deterioration in environmental quality. Adapted from Aje and Ewubare (2011, p37).

On the one hand, industrialization contributes to the economic wellbeing of the people while affecting the quality of the natural environment which the people constantly interact with. On the other hand, the natural environment life and quality which are negatively affected deteriorate the wellbeing of the people in the economy.

### 5.0 Towards a Sustainable Development: The Dilemma

The concept of sustainable development is of recent origin. The term "sustainable development" was first used by the World Conservation Strategy presented by the International Union for Conservation of Natural Resources in 1980. It was commonly used and defined for the first time by the Brundtland Report in 1987 as "meeting the

needs of the present generation without compromising the needs of the future generations” (Redcliff, 1987). Sustainable development emphasizes the creation of sustainable improvement in quality of life of all the people through increase in real per capita income improvements in education, health and general quality of life and the preservation the natural environment.

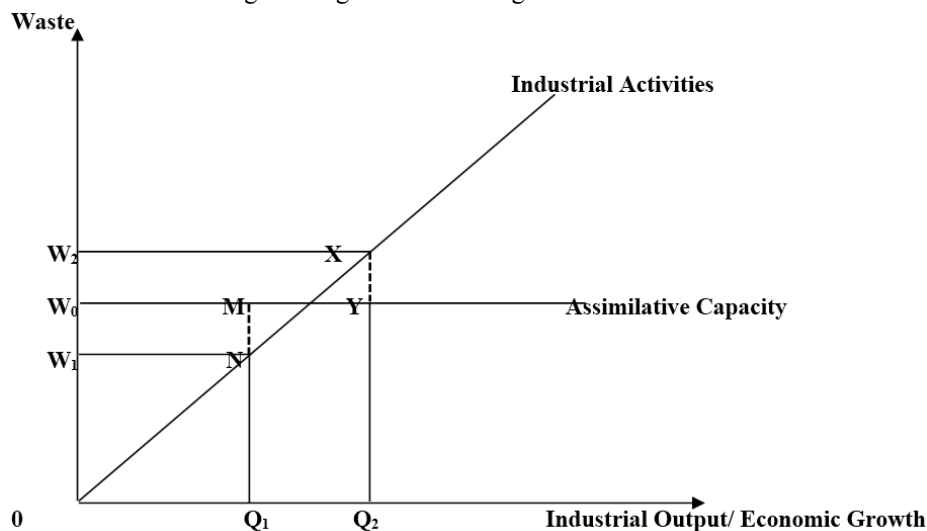
Sustainable development is such development that is unending, which contributes to the quality of life through improvements in natural environments. Natural environments, in turn, supply utility to individuals, inputs to the economic process and services that support life (Jhingan, 2011). In the view of Pearce and Warford (1989), sustainable development describes a process in which natural resource base is not allowed to deteriorate. It emphasizes the hitherto unappreciated role of environmental quality and environmental inputs in the process of raising real income and the quality of life.

From the concept and definition of sustainable development above, it becomes obvious that many countries of the world, especially the less developed countries (LDCs), are yet to have the type of development that is sustainable. Many of the countries are recording some level of economic growth. However, this cannot translate to sustainability as a result of the adverse effects of the activities; which constitute the growth, on the environment.

Countries are therefore faced with the choice of either to reduce the level of industrial activities that drive the economy to growth thereby slowing the rate of their economic growth and development while the natural environments and resources are preserved and protected, or continue to expand industrial activities and industrialization which constitute economic growth at the expense of the green economy. This is, no doubt, a great dilemma to developing countries that are faced with alarming rate of poverty and unemployment, as well as high population rate. They are almost left with no alternative than to continue to mount pressure on the available natural resources to tinker their economic problems.

This dilemma has generated reactions from different countries among the LDCs. Many regard the call for conservation and preservation of natural resources and the reduction of other economic activities that affect the quality of the environment by the developed countries as consciously orchestrated efforts to stifle any chances of the LDCs catching up with them (the developed countries) in development.

The dilemma can be illustrated using the diagram below at figure 2.



**Figure 2:** Source: *Author's Graphical Analysis*

The diagram above shows the dilemma faced by the fewer developing countries (LDCs). The assimilative capacity curve, which is horizontal, shows the ability of the environment to degrade wastes comfortably. Industrialization is associated with wastes. As industrial activities occur in a country, wastes and pollutions are generated; showing a positive relationship between industrial activities and waste generation. That is, the more the industrial activities or industrialization, the more wastes and pollutions are generated and discharged into the natural environment  $(Q_2 \rightarrow W_2 X) > (Q_1 \rightarrow W_1 N)$ .

From figure 2 above,  $Q_1$  shows industrial output which is low as a result of low industrial activities or industrialization, leading to slow economic growth. But it is observed that at this output level, wastes and pollutions generated,  $W_1$ , are below the assimilative capacity  $W_2$  of the environment. The volume wastes generated are captured at the dotted line MN, which the environment can comfortably transform and degrade without reducing the quality of green economy. If a country remains at this point, it can only make little or no progress economically while the natural environment and the resources are preserved and conserved. But the LDCs can never wish to remain at this position where their economic growth rate having no impact on the entire

system.

The output position  $Q_2$  shows greater industrial output. This means high industrialization and industrial activities; recording high economic growth. However, at this point, the level of wastes and pollution generated is  $W_2$ , which is higher than the assimilative capacity curve,  $W_0$ . The volume of wastes generated is dotted line capture at XY; the gap between the industrial activities and the assimilative capacity curves. The environment cannot assimilate or degrade the level of wastes and pollutions discharged into it at this point, hence, the environmental quality is degraded and the green economy destroyed.

If a country chooses to expand industrialization to this higher level of output, which most LDCs do, it will record high level of growth which cannot be sustainable overtime. This is as a result of the rapid decline in the quality of the natural environment which equally serves as a major source of input for the industrial sector. Also, the lives of the living organisms, including the humans, in the environment stand a great risk of survival in such highly contaminated and pollution ridden environment, hence the economic growth becomes almost useless. This is indeed a great dilemma.

Now the question become: How do we reconcile these two extreme situations? How do we create a balance between the life of the natural environment and industrialization to achieve sustainable development?

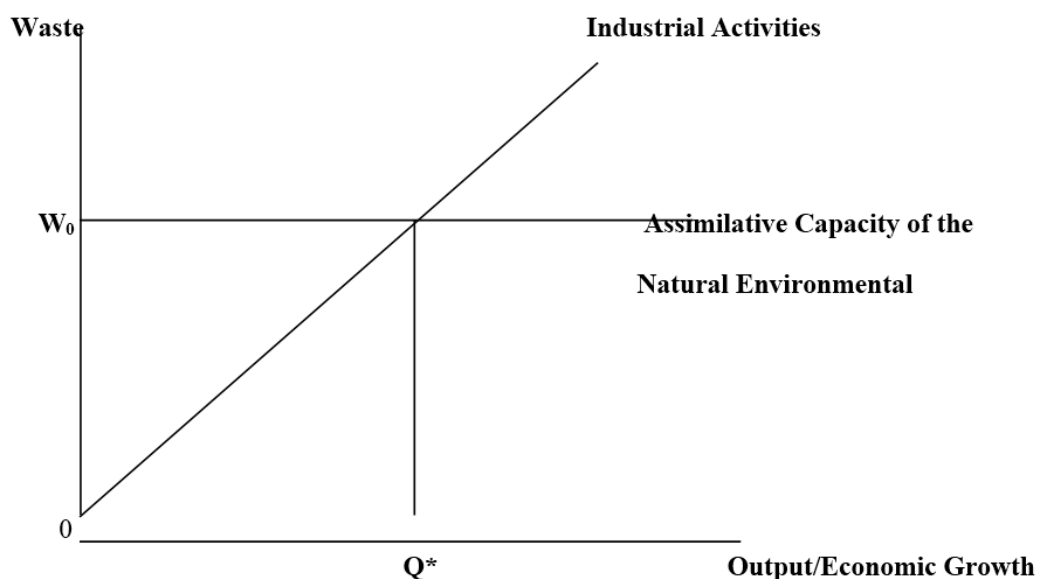
## 6.0 The Way Forward

The problem above can be tackled through the principle of “trade-off”. Given the assimilative capacity of the environment, there should be a trade-off between industrialization (economic activities) and environmental quality. That is, giving up of some industrial activities to preserve, to a great extent, the quality of the environment, and using up some environmental assets and resources to achieve some level of industrialization which will lead to growth and development.

There should be an establishment of what is called “the ecological threshold”. The ecological threshold is a point at which both the environment and industrial activities can interact favourably with little or no threat to the survival and sustenance of each other. At the ecological threshold point, the level of wastes and pollutions generated by industrial activities can be comfortably transformed and degraded by the natural environment without affecting its quality. Any attempt to increase output beyond the threshold point will distort this condition of stability or equilibrium thereby affecting the environmental life negatively, hence entire social system.

However, there are intense pressures on the LDCs to always advance beyond the threshold point in their industrial activities and development quests. The only way to increase production and economic activities beyond the threshold point is to either enhance the assimilative capacity of the environment so as to absorb more wastes that will be generated from the increased industrial activities, or reduce the quality and quantity of the wastes generated so that the environment can transform them easily; maintaining a healthy green economy. These can only be achieved through the advancement in technology. This will enhance the assimilative capacity of the environment, making industrial activities and production processes generate less harmful wastes and pollution as well reduce the level of the entire waste generated in the economy.

The view presented above can be illustrated using the geometrical models in figure 3 below.

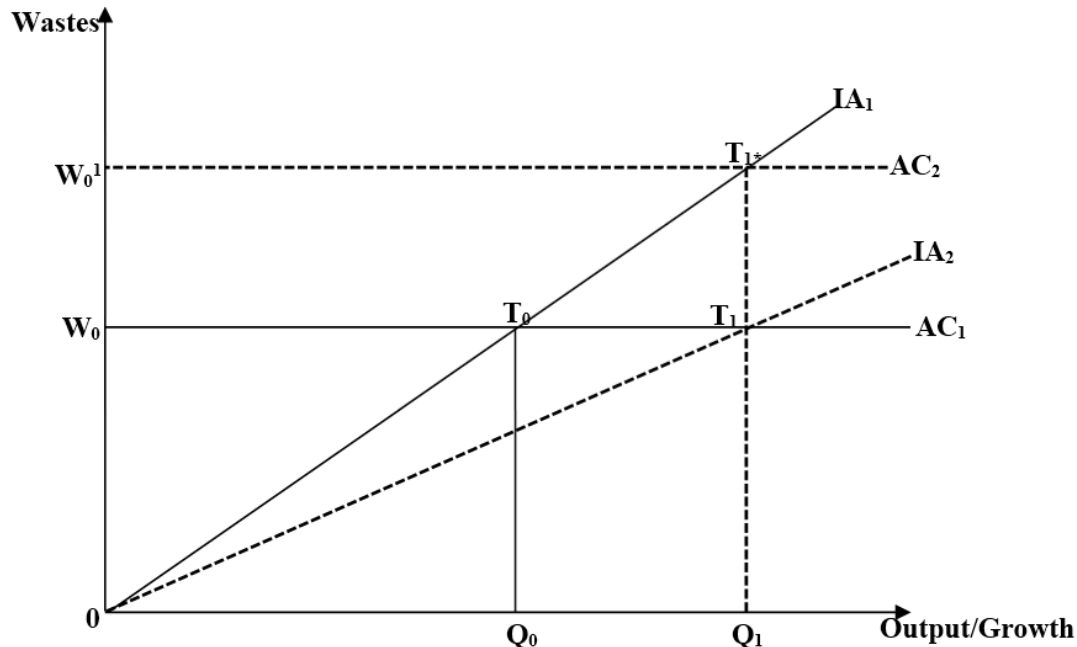


Source: Ajie and Ewubare (2011)

**Figure 3A:** Ecological Threshold of Industrialization and the Environment.

The ecological threshold is point of stability or equilibrium between industrial activities and the quality of the environment. At this ecological threshold point,  $T$ , output  $Q^*$  is produced through industrialization, and waste  $W_0$  is generated. Also, the waste and pollutions generated at this point can be degraded by the natural environment through its assimilative capacity as seen from the intersection of the industrial activities and assimilative capacity curves at point  $T$ .

Technological advancement can help improve and enhance the ecological threshold. This can be illustrated from the figure below.



Source: Author's Graphical Presentation

**Figure 3B:** Expansion of the Threshold position through Technological Advancement

Where:  $IA_1$  = Industrial Activities before advance in technology

$IA_2$  = Industrial Activities after advance in technology

$AC_1$  = Assimilative Capacity of the Natural Environment before advance in technology

$AC_2$  = Assimilative Capacity of the Natural Environment after advance in technology

The model above in figure 3B above shows how technological advancement can help improve and enhance the ecological threshold, thereby giving room for increase in the level of industrial activities without hurting the quality of the natural environment. The effect of this can be captured in two ways:

1. Through technological advancement, the process of decomposition of wastes can be accelerated which will enhance the quality of the assimilative capacity of the natural environment. A technological change of using activated charcoal in sewage treatment facility will reduce the concentration level and accelerate the decomposition process of the municipal wastes (Ajie, 2011). This amounts to artificial enhancement of the assimilative capacity of the environment. The effect of this technological change will be a shift in the assimilative capacity curve upward from  $W_0$  to  $W_0'$  as shown in the figure 3B. As the assimilate capacity of the environment is enhanced, the ecological threshold point shifts from  $T_0$  to  $T_1'$  which enables industrial activities and output to increase from  $Q_0$  to  $Q_1$ , and the economy grows without causing any harm to the natural environment.
2. Another area that can be affected by the advancement in technology in our model in figure 3B is the industrial activities curve. Through technological change, industrial activities and production can be increased with relatively low wastes and pollutions, both in quantity and quality, per unit output, which enables the environment to degrade more of the wastes comfortably without affecting its nature. For instance, the industrial sector of an economy produces a total of 1 million outputs of goods with the total of wastes and pollutions generated amounting to 10,000 in volume, both in quantity and quality; which are also the maximum volumes the assimilative capacity of the environment. If through technological advancement in production processes and equipment the sector can produce the same quantity of output of goods (1 million) with just 2,000 volumes of wastes and pollutions generated, it can now comfortably increase output to 5 million to generate the volume of wastes of 10,000 which is the maximum volume the environment can degrade without harm. Thus, there will be increase in productivity, and the economy will record growth while maintaining the quality of environmental quality.

Also, for example, a switch from high to low sulphur content coal in production of electricity would lower the amount of sulphur emitted into the environment per kilowatt-hour of electricity produced. This will result to a clockwise shift of the industrial activities curves from  $IA_1$  to  $IA_2$ , establishing a higher ecological threshold position from  $T_0$  to  $T_1$  at the point of intersection between the  $IA_2$  to  $AC_1$  curves, and output increases from  $Q_0$  to  $Q_1$  leading to economic growth.

## 7.0 Recommendation

Based on the discussions and analyses made above, the following pragmatic approaches can be taken by governments and non-governmental organizations (NGOs) of the LDCs to help increase the level of industrialization while conserving the quality of the natural environment.

- i. Government, in partnership with the private environmental firms, should focus on conducting a comprehensive and thorough Environmental Impact Assessment (EIA) of every production activity in the country. This give a clear picture of the possible rate of or volume of wastes and pollutions to be generated by any production activity so as adequate measures could be taken to mitigate or control them.
- ii. Governments of the LDCs should encourage the importation of environmentally friendly equipment and technologies that would make production and other human activities less harmful to the quality of the natural environment. This can be achieved through subsidizing and granting an import duty waiver or reduction to the importers of those facilities.
- iii. There should be an established scheme, through legislation, that would grant incentives to those firms that produce goods with less pollution and wastes per output, while the production of goods with much pollution per output should be discouraged through the imposition of heavy fine or outright ban.
- iv. There should be government-private sector partnership to adequate sensitize the citizens of the LDCs on the long run negative effects of the environmental unfriendly activities on the entire welfare of the people at large. This will go a long way reducing the various conscious unfriendly activities that culminate to environmental degradation on the long run.
- v. The LDCs should show more commitment in the pursuit of sustainable development by enacting environmental laws that would help curb the harmful activities of firms, especially the multinational firms.
- vi. As a quick follow up of the point made in v above, governments of the LDCs should equally institute incorruptible monitoring and inspecting teams and agencies that would ensure maximum compliance and implementation of the various environmental laws.
- vii. The private sectors should adopt more environmental friendly production techniques and processes that would reduce wastes and pollution so as to comfortably increase output without causing harm on the natural environment.
- viii. Most of the LDCs are associated with corruption and corrupt practices. These have helped defeat the various measures to bring stability in the use of environmental resources. Therefore, there should be grave punishment on corruption and corrupt practices which would help reduce the issues of compromising the measures put in place to achieve sustainable development.

## 8.0 Summary and Conclusion

It has been established in this study that both industrialization and the preservation of green economy are necessary for sustainable development. In other words, no country can achieve a continuing “golden economy” (industrialization) without achieving a green economy alongside, and vice versa. This therefore can be made possible by having a trade-off between industrialization and the quality of the environment to attain a balance or an equilibrium state known as the threshold point. The best and only realizable way of expanding industrial activities that is less harmful to the environment is through technological changes or technological advancements. Therefore, the LDCs should pursue the policies that would enhance their technological base so as to be able to pursue rapid industrialization, which is imperative for their developments, without destroying the green economy for a sustainable development. Also, the more developed countries (MDCs) of the world should play an active role than just an advisory role by assisting the LDCs with some technological capacities need for them to achieve wastes and pollution-less industrialization, hence, preserving and improving global environmental condition.

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