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# Green Technology: A Contribution to Sustainable Development in Nigeria

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### Authors' contributions

This work was carried out in collaboration between all authors. Author OCJ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors OCJ managed the analyses of the study. Author EROC managed the literature searches. All authors read and approved the final manuscript.

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## ABSTRACT

In Nigeria, many established and establishing technological industries produce effluents that add to Global warming which have been on the increase continuously in the years back, conveying several undesired significances to Earth and human life. Forecasts propose that the significances will linger over the years to come. Among the solutions to assuage this problem is the adoption of green technologies. As a result, this paper examines the contribution of green technology to sustainable development of other countries and compare it with that of Nigeria. It also presents an avenue via which green technology can improve Nigeria's sustainable development, and also examines Policy Requirements for its Development in Nigeria.

*Keywords: Green technology; sustainable development; renewable; environment.*

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## 1. INTRODUCTION

In Nigeria there is an unprecedented rise in energy prices as a result of over dependence on old-fashioned sources of energy. Global environmental issues like global warming and climate change have the ability to intensely alter the world environment. Additionally, the persistent pressures of urbanization, manufacturing and population increase requires a transformed assurance to clean energy and environmental solutions.

Green technology has appeared as an important inclination which is understood will take a lead towards repositioning Nigeria's energy and environmental concerns.

This paper offers a general viewpoints of green technology, benefits of embracing green technology, and classes of green goods and services. It concludes by presenting policy requirements for adopting green technology in Nigeria.

### 1.1 Objectives

- To determine the level environmental Sustainable Development has grown in Nigeria and compare it with other countries.
- To determine various ways Green Technology can boost an economy sustainable development.
- To see how Green Technology will boost Nigeria's sustainable Development.

## 2. CONCEPT OF GREEN TECHNOLOGY

According to [1] green technology is a general term often used interchangeably with clean technology, climate related technologies or environmental technologies. It is also seen as mitigation and adaptation technologies. [2]. Nevertheless, it has been recognized in this paper that green technology is that technology which is not only used to encourage sustainability, reduce greenhouse gas emissions, but also assist in proffering answers to climatic changes.

Green technology also is to bring about eco-friendly defense via environmental valuation, sustainability in energy production processes and various technological processes to protect, recover and heal previously injured

environments. In United States for instance, fifty-seven percent of businesses used green technologies or practices to improve energy efficiency within their establishments in August 2011, and over half used green technologies and practices to reduce or eliminate the creation of waste materials as a result of operations [3].

Below are some of the application fields of green technology. Green technology is applied in recycling processes, water and air purification technologies. Others are in sewage management, and energy utilization.

### 2.1 Benefits Accruing from Green Technology Adoption

Green technology offers a lot of benefits to manufacturers in developing countries as shown below. According to, R. Luken and F. Van Rompaey [4], it offers manufactures the ability to have their products meet strict product specifications in foreign markets. Green technology can advance production efficacy through the reduction of input costs, energy costs and operating and maintenance costs, which can increase a company's competitive position.

### 2.2 Classifications of Green Goods and Services

Green goods and services which consumers utilize fall into one or more of five groups in (Table 1).

### 2.3 Sustainable Development Traits of Green Technology

Green technology is a technology that when properly adopted enables us to a greater extent to bring to the barest minimum the greenhouse gas emissions. In addition to proffering innovative solutions, green technology also plays a vital role in enhancing clean technologies that currently exist and lowering the costs of the same, [5].

The environmental rewards of green technology are vast, and some of them according to [6] are that it makes use of:

renewable resources,  
Latest techniques for energy production. It uses innovative technological methods to make waste less dangerous, and also produce environmentally friendly products.

**Table 1. Classification of green goods and services**

Various green goods and services	Basis Instances
Electricity energy	Renewable sources such as airstream, biomass, geothermal, and solar. Others are ocean, and hydropower.
Pollution management, reduction in greenhouse, recycling and reuse.	These products and services that mitigate or eliminate: <ol style="list-style-type: none"> <li>i. the production or liberation of pollutants that are toxic to the environment;</li> <li>ii. Emission of greenhouse gas via means that are not renewable;</li> <li>iii. the formation of unwanted resources and recycle.</li> </ol>
Environmental agreement, instruction and teaching, and municipal mindfulness	These goods and services: <ol style="list-style-type: none"> <li>i. impose environmental principles;</li> <li>ii. offer knowledgeable trainings relating to green technologies.</li> </ol>

**2.4 Challenges to Green Technology Adoption**

Basically, green technology appears to be more expensive than the technology is replacing. This is as a result of the fact that it puts into consideration the costs of many conventional production processes. Due to the fact that it is innovative, the associated progress and training expenses makes it even more outrageous in equating it with traditional technologies. Accepting and the diffusion green technology can be prevented by inappropriate guiding context. Others are high executing costs, absence of information, and an alternative raw materials inputs. Additionally, doubt about performance impacts, and lack of human resources and skills, [4].

**3. RESEARCH METHODOLOGY**

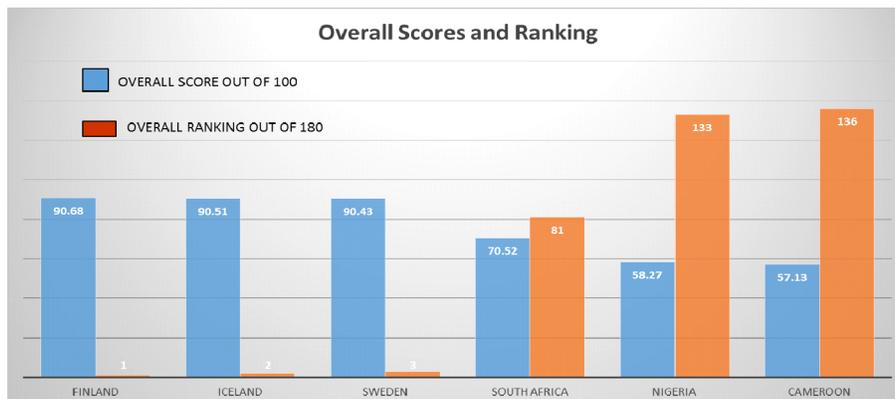
Descriptive analytical techniques were employed to gather data originated from secondary sources: previous research and analysis of scholars, as well as journals articles that are related to the subject. The use of statistical tools would be used to describe the results of the

findings. Tables, graphs, charts and percentages would be used for analysis.

**4. RESEARCH RESULTS AND DISCUSSION**

From the result analysis on EPI, GGEI and SDGI, 2016, Finland with area of 303,890 sqkm, 5.44 million people and \$49,414 GDP, ranks the first, 3<sup>rd</sup> and 4<sup>th</sup> respectively, and performing well on the indicators evaluated, while Sweden, 407,340 sqkm, with 9.60 million people and \$62,619.00, ranks 3<sup>rd</sup> in EPI, first in GGEI, and first again in SDGI respectively, with their environmental performance top-notch in the areas evaluated.

Nigeria's overall performance score on the GGEI is better than many other countries, ranking 43<sup>rd</sup> out of 80 countries covered. Despite rapid growth, its environmental result is worrisome, ranking 133<sup>rd</sup> out of 180 countries, having 141 position on SDGI. The Nigeria's GDP (\$2,663.00), is quite low in comparing with that of Finland and Sweden. Therefore, there should be an improvement in those indicators evaluated in Nigeria.



**Fig. 1. Overall scores and ranking of environmental performance index, 2016**

Source: Yale university, 2016 (epi.yale.edu)

**Table 2. (Environmental performance index, 2016)**

Finland GDP(\$49,414.00); 5.44 million people; 303,890 Square Km				Overall score out of 100	Overall rank out of 180
Sweden: GDP(\$62,619.00); 9.60 million people; 407,340 Square Km					
Nigeria: GDP(\$2,663.00); 173.62 million people; 910,770 Square Km					
Indicators	Score	Rank	10 years change (%)		
Health Impact	99.35	4	0.08	90.51	1
	99.03	5	1.58	90.43	3
	42.77	149	1.63	58.27	133
Air Quality	93.77	18	16.99		
	93.26	22	23.03		
	72.15	126	23.67		
Water and Sanitation	98.57	26	-0.22		
	99.57	16	-0.07		
	44.11	153	45.77		
Water Resources	93.52	18	7.38		
	96.08	12	6.71		
	22.56	123	100		
Agriculture	85.89	87	-6.33		
	100	1	7.24		
	100	1	28.21		
Forests	17.37	106	-0.4		
	16.32	107	-0.43		
	58.27	56	-0.43		
Fisheries	72.87	8	2.27		
	50.82	63	13.46		
	53.3	55	-12.05		
Biodiversity and Habitat	96.93	19	0.04		
	88.76	57	3.58		
	75.43	107	-0.49		
Climate and Energy	90.2	18	0		
	92.73	10	0		
	82.17	38	0		

Source: Yale university, 2016 (epi.yale.edu)



**Fig. 2. Global green economy index, 2016**

Source: Global Green Economy, 2016



**Fig. 3. Sustainable development goal index, 2016**  
 Source: Sdg Index and Dashboards-Global Report, 2016

## 5. POLICY REQUIREMENTS FOR ADOPTION OF GREEN TECHNOLOGY IN NIGERIA

Nigerian government should design policies: to fortify institutional contexts by the establishment of a Green Technology Committee among ministries; the establishment of a Nigerian Green Technology Agency to coordinate and oversee initiatives and programmes: To inspire the progress of green technology divisions by making higher-learning and research institutions for R&D provisions; enlarged foreign and local investment; creation of a Green Technology Trust; and the appreciation of green products via values, rankings and classification programmes. Others are policies to develop human resource capability development of green technology units in Nigerian universities; presenting monetary and economic encouragements for students pursuing studies in green technology disciplines at both the undergraduate and graduate stages; reskilling and traineeship structures for green jobs.

## 6. CONCLUSION

In conclusion, green technology, especially in the area of environment has contributions to sustainable development. Therefore, to meet the environmental performance, the country should have centers of excellence in know-how that has strategic partnership with leading countries, and a tradition in the development of environmental solutions to be present in various sectors.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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