AN EVALUATION OF THE EFFECTS OF TECHNOLOGY ON THE ENVIRONMENT

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Abstract

Technology is a very important aspect of the human life. It offers the promise of a better life and inadvertently makes life easier for everyone who embraces it and moves with its tide. Many times, we are so wowed at how far the world has come in terms of technological advancements that we do not even pause for a second to consider their effects on our environment. This paper examined the effects of technology on the environment. The research methodology adopted is Doctrinal Legal Research through reliance on both primary and secondary sources of law. This paper finds that technology can have both positive and negative effects on the environment, the negative effects though are numerous and more glaring. There exist green procurement strategies for technology acquisition, use and disposal; green technologies or green ICTs. This study also finds that advancement in technology does not have to be an environmental taboo because technology can and even has the role of curing environmental problems. This paper concludes that the same way technology cannot exist void of the environment, the environment also cannot be whole outside of technology. Makers and users of technological accessories must be conscious of the environment and pursue sustainability.

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1. Introduction

A modern marvel that has taken off in our daily lives is technology. Technology makes even the most challenging activities effortlessly simpler and more effective.[1] Technology is a very important aspect of the human life.[2] Technology is the application of scientific knowledge for practical purposes, especially in industry. Technology could also mean machinery and equipment built from the application of scientific knowledge. Technology is about acting to meet a human need and this is the goal of science. When a technological breakthrough is made on a long-standing problem (e.g., the invention of the microscope aided the study of organisms smaller than what our physical eyes could see), it aids our understanding of how the world works and this in turn leads to the development of other technologies.[3]

In other words, technology is the manmade hardware and knowledge used for the production of objects that enhance human capabilities in performing tasks that they could not otherwise performed. These objects are invented, then designed, manufactured and eventually used. The production of every

[1] Jennifer L. Harris, Mohammed T. Al-Bataineh, Adel Al-Bataineh, One on One Technology and its effect on Student Academic Achievement and Motivation at CONTEMPORARY EDUCATIONAL TECHNOLOGY, 2016, 7(4), 368-381

[2] H.A Kwazo, M.U Muhammad, G.M Tafida, S. Mohammed, 'Environmental impact of Technologies', Academic Journal of Interdisciplinary Studies, MCSER Publishing, Rome-Italy, E-ISSN 2281-4612, ISSN 2281-3993, November 2014, Volume 3, No. 7.

[3] https://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/technology/what-technology last viewed on 27th of July, 2021.

technology involves important inputs e.g., labour, skills, energy and raw materials.

Three kinds of technologies can exist;

i. Mature Technology which is almost impossible to improve on,
ii. Incremental technology that can be improved through learning and R&D
iii. Revolutionary Technology.

The environment simply means the natural world; the surroundings or conditions in which a person, animal or plant lives or operates. Environment is the sum total of all the living and non-living elements and how they affect human lives. Living and biotic elements include plants, animals, forests, fisheries and birds, non-living or abiotic elements include water, air, sunlight, rocks and land.[4]

Environment is a common commodity possessed by all, so it concerns all living things. For humans, environment includes the whole physical world with social and cultural condition.

"The environment for humanity includes factors such as land, atmosphere, climate, sounds, other human beings and social factors, fauna, flora, ecology, bacteria, and so on."[5]

[4] https://byjus.com/commerce/meaning-and-functions-of-environment/ last viewed on the 21" of July, 2021.
[5] J. Webster (ed.), Wiley Encyclopedia of Electrical and Electronics Engineering Copyright c 1999 John Wiley & Sons, Inc. Uploaded by Halit Eren on 29th October, 2016. https://www.researchgate.net/publication/295223499

The Five Components of the Environment.

1. Lithosphere: the lithosphere consists of rock and soil and because humans are configured to survive on land, the lithosphere plays a major role in the development of civilization. The earth can be said to be made up of three layers, the Core, the Mantle and the Crust. The Core and the Mantle make up about 99% of the earth's mass and volume. But the importance of the Crust cannot be overemphasized for humans and animal. The crust can be divided into two; the upper crust and the lower crust. The top few kilometers of the upper crust are largely formed by sedimentary, Igneous and Metamorphic rocks. Soil is the basis of agriculture and agriculture is the basis of civilization. Soil is formed on land surfaces when hard rocks are modified by physical, chemical and biological processes. Soil becomes perfect for agriculture when rock and fresh or organic matter get mixed together.
2. Hydrosphere: Land only occupies about 36% of the earth's surface, that is just one-third. The remaining 64% is water. The earth surface is covered by oceans. Oceans take up about 97% of the earth water. Water naturally has a cycle that runs between the atmosphere, land and sea.
3. Cryosphere: "Cryo" means freezing or cold, cryosphere is the frozen part of the earth like glaciers and sea ice. The cryosphere reportedly contains about 2% of the world's water. It plays an important function in global energy balance and water mass balance as the melting of ice in Antarctic alone can lead to a rise in sea levels by 18m.
4. Atmosphere: atmosphere contains a mixture of gases, which includes, 75% nitrogen, 23% oxygen, 0.28 Argon and 0.05% Carbon dioxide. The atmosphere also contains water vapor and

Sulphur dioxide. The ozone layer, with an estimated ozone amount of 4 billion tons, is about 15 to 50 kilometers above the earth surface. The atmosphere consists of different layers like the Troposphere, Stratosphere, Mesosphere and Thermosphere.

5. Biosphere: from time immemorial, there has been a close interaction between the biosphere and the atmosphere. With humans especially affecting the chemical composition of the atmosphere through activities like pollution and deforestation. The Biosphere is the beautiful name for the ecosystem and biological diversity of the world. biodiversity includes all living organisms. The estimated number of species in the world ranges from about 5 to over 50 million species. Anthropogenic factors that lead to the depletion of biodiversity include;

a. greenhouse effects and the depletion of the ozone layer
b. pollution and too much use of agrochemicals
c. destruction or alteration of habitats
d. overexploitation of flora, fauna and marine life
e. intentional importation of exotic species
f. reduction of genetic diversity
g. intentional annihilation or introduction of pests.

We are presently living in a highly innovative period with technological advancements increasing by the day along with big changes relating to liberalization of markets and the globalization of economic and cultural interactions.[6]

[6] Dennis Anderson, Christopher Clark, Tim Foxon, Robert Gross, Michael Jacobs, "Innovation and the Environment: Challenges and Policy Options for the UK", Final Report from Workshops Sponsored by the Economic and Social Science Research Council's Global Environmental Change Program, Imperial College Centre for Energy

Since the beginning of the third millennial, many global environmental challenges have become matters of great concern. These environmental challenges include ozone depletion, climate change, diminishing biodiversity, hazardous waste, overpopulation etc.[7] these are challenges that is facing the whole world but more pronounced in developing and developed nations. If we happen to get a search warrant and we investigate the cause of these global environmental challenges, we will catch technology red-handed. But also, if we only see technology painted black at all times, then we are most likely shortsighted. As eager as technology seems to destroy mother earth, it also contains the ability to replenish the environment if put to use the right way.

Discussion

6. Technology and the Environment

The use of technology by humans is one of the main sources of environmental issues. Environmental issues can be both caused by and solved by technology. Additionally, it is an essential tool for both local and worldwide environmental observation and monitoring. Technology is essential in solving environmental issues, but it cannot solve anything on its own.[8]

Technology has huge impacts on the environment, even though its impacts are not often noticed or considered. These impacts are expressed throughout

Policy and Technology and the Fabian Society, Imperial College of Science, Technology and Medicine, Economic and Social Research Council, SBN:1 903144 019, Chapter 1.

[7] J. Webster (ed.), Wiley Encyclopedia of Electrical and Electronics Engineering Copyright c 1999 John Wiley & Sons, Inc. Uploaded by Halit Eren on 29 October, 2016. https://www.researchgate.net/publication/295223499

[8] Ibid

the production, use and disposal of all technological accessories in our environmental premises. There is an essential need for the monitoring and understanding of every stage of a technology's life cycle. Technological accessories abound around us, we use some at home, at work or in school like Computer Systems, Televisions, Electric power Generators, Air Conditioners, Microwaves, Washing Machines, Telephones, Freezers, Ceiling Fans etc. to mention but a few. Some technological accessories are industrial in nature; they help a great deal in making life easier for users. Some technological accessories have even now taken up the work formally done by humans.

The effect of technology on the environment can be both direct and indirect. Direct impacts are usually made by new technologies that introduces new substances. Many of these new substances like Chlorofluorocarbons have novel and direct effects on the environment. Indirect effects are caused when humans are unable to mobilize vast resources and expand economic output through productivity and efficiency from continuous technological change.

Because technology is not uniformly developed, accepted and used, its effect on the environment is also not uniform throughout the world. the use of technology varies from country to country based on the economic and social conditions of that country. Many people in the world today are cut off from basic technologies.

7. Negative Effects of Technology on The Environment

Most of the 21st century global challenges can be traced back to technology. Extraction of mineral resources, emission of toxic materials, soil pollution, water pollution, air pollution, deforestation, oil pipe vandalism and every

problem that comes along with it, diminishing biodiversity, ozone depletion, climate change, greenhouse effects over population etc. have created conditions of unprecedented environmental catastrophe and have caused and is still causing irreversible damage to the biosphere.[9]

In developing nations, people lack access to good sanitation services and safe drinking water and thousands of people die annually because of the dust, soot and smoke in the air. Overuse of renewable energy and damage from pollution are threatening the world's agriculture, fisheries and forestry, the physical environment is also bearing the brunt of some of man's poorest decisions. The impact of technology on the environment is now felt in the atmosphere, biosphere and hydrosphere. The negative effects of technology can be considered from the perspective of Agriculture and Industry.

I. Agriculture: as the population of the earth continues to go, more forests and wetlands are cleared up and turned into crop lands. Agriculture is the largest user of land and water resources.[10] Before the industrial revolution, about 75% of the workforce of a nation work on the farm but now in industrial nations, only about 3% of the workforce do so. There is an increased shift in how people now migrate from the rural areas in search of "greener pastures" leaving behind the real green pastures. This

[9] H.A Kwazo, M.U Muhammad, G.M Tafida, 5. Mohammed, "Environmental Impact of Technologies", Academic Journal of Interdisciplinary Studies, MCSER Publishing, Rome-Italy, E-ISSN 2281-4612, ISSN 2281-3993, November 2014, Volume 3, No. 7.

[10] J. Webster (ed.), Wiley Encyclopedia of Electrical and Electronics Engineering Copyright c 1999 John Wiley & Sons, Inc. Uploaded by Halit Eren on 29th October, 2016. https://www.researchgate.net/publication/295223499 Julia Martinez, Great Smog of London environmental disaster, England, United Kingdom (1952) https://www.britannica.com/event/Great-Smog-of-London last viewed on the 27th of July, 2021.

kind of migration leads to urbanization or better put, overpopulations in the cities which in turn lead to accommodational, economical, transportation and health care problems to mention just a few.

II. Industrialization: industrialization has generated more wastes and pollutions than communities can handle at significant points in history, some of which their long-term negative effects are still yet to be fully unraveled. New Materials and substances are introduced everyday courtesy of technology like plastics, vaccines, drugs, pesticides, composite materials, isotopes etc. Air pollution, water pollution and Soil pollution are all negative effects of technology on the environment.

8. Case Studies

1. The Great Smog of London 1952: lethal smog covered the city of London from December 5-9 in 1952. The catastrophic situation was caused by a combination of industrial pollution and high-pressure weather condition.[11] The combination of smoke and fog brought London close to a standstill and people died in their thousands. Four years after this terrible incident, the Clean Air Act was passed. The polluted fog has been a problem in London since the 13th century, it was caused by the burning of coals and only got worse as the city of London expanded. As industrialization increased in London in the late 1700s, the condition grew worse. The word "smog" is a merger of the "smoke" and "fog". On December 5, 1952, an anticyclone settled over London, this is a high-pressure weather system that caused an inversion, cold air was trapped below the warm air higher up. Because of

[11] Julia Martinez, Great Smog of London Environmeental Disaster. England, United Kingdom (1952) https://www.britannica.com/event/Great-Smog-of-London last viewed on the 27th of July, 2021.

this, emissions from factories and domestic fires could not be absorbed into the atmosphere but were trapped near ground level. This led to the worst fog the city had seen until then. People were not able to see, transportation was restricted, ambulances could not move. People died especially of Bronchitis and Pneumonia; Cattle choked to death. About 4000 people reportedly died from the incident. Statistics have it that the long-term casualties from the great smog were up to about 12000. The Clean Air Act passed in 1956 is considered a huge milestone in the history of environmentalism even though London experienced another Smog in 1962.

2. The Great Stink of Central London: this event occurred in July and August 1858 in Central London when the hot weather worsened the smell of untreated human waste and industrial effluent on the bank of the River Thames. For many years a bad sewer system has been dumping waste directly into River Thames. There were three Cholera outbreaks before the Great Stink based on the situation. Constructions were eventually embarked on that put an end to sewage being dumped in the Thames and Cholera Outbreaks became a thing of the Past.

3. China: China is the fastest growing country in the world in the realm of technology but this success rate comes at the cost of the deterioration of the environment.[12] Environmental problems like water shortages and pollution, desertification, outdoor and indoor air pollution (caused by coal combustions and motor-vehicle emissions) and soil pollution have become the order of the day, subjecting Chinese residents to great health risks and the whole world at large to great environmental risks. Exposure of the

[12] Haidong Kan, "Environment and Health in China: Challenges and Opportunities" Environmental Health https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2799473/last viewed on the 27th of July, 2021.

residents to contaminated water has increased their risks of having digestive cancers, Cholera and hepatitis. China also puts the world at risk of Climate Change, Disposal and Treatment of Electronic Waste and heavy metal Soil Pollution. The COVID LAB-LEAK THEORY-There is a controversial claim that the Corona virus might have escaped accidentally or otherwise from a Research Laboratory in Wuhan, China. U.S President Joe Biden in May 2021, ordered a full investigation into this theory.[13] The Wuhan Institute of Virology is said to have been studying Corona Viruses in Bats for over a decade now. If this is not just a conspiracy theory, and turns out to be true after full investigation, then the Corona Virus outbreak that ravaged the whole world could be classified as a negative effect of technology on the environment.

5. **Positive Effects of Technology on the Environment**

Technology is the key to improving environmental productivity and this is through the developments of environmentally friendly products, services and means of production. Science based technological innovations offers the promise of a better world especially the provision of a better health care system, elimination of diseases and a better standard of living for all. However, though, one cannot assume that technology will compulsorily lead to an improved environment, conscious steps have to be taken to get the desired results.

Some of the positive effects of technology include,

[13] BC NEWS "Covid Origin: Why the Wuhan Lab-Leak theory is being taken seriously". https://www.bbc.com/new/world-asia-china-57268111.amp last viewed on 27th of July, 2021.

I. Agriculture: After Fire, agriculture is the oldest human technology and has always been of great importance and use for the Biosphere. Intensive soil cultivation, irrigation and reservoirs have been a part of many communities' agricultural experience from the beginning of time. Technology has made a better agricultural experience possible. More food can be provided now for the world in a short period of time and with little man power because of the development of some machineries and Know-hows.

II. Industrialization: Major technological breakthroughs started in the industrial world in the 18th century. With the Textile industry in the UK in 1820 and the England Steam Power that opened up the world to mechanization and factory systems. A lot of innovations, accumulated knowledge and social interactions led to the industrial revolution. This led to the substitution of human efforts on a large scale, the switch from animal power to fossil fuels and this made more power available and easily accessible and the use of abundant raw materials. The positive effect of technology on the environment in the realm of industrialization include mass production technology, increased efficiency and productivity, emergence of multinationals, air and road transportations, communications networks, enhanced cultural and informational exchange etc. Industrialization is the heartbeat of global change.

ICT: the introduction of Computer systems into the home, school and work environment is saving the world from using much paper files. The beautiful meaning if this is that this technology is curbing deforestation. Because of the computer technologies millions of trees around the world get to stay alive. Forests are being preserved.

IV. Recycling Technology: It is true that Technology is the biggest cause of waste throughout the world but it is also through that with the recycling technology, technology can also be the solution to the problem. The recycling technology helps to eliminate waste.[14]

V. New Methods of Generating Power: Technology is the major cause of the pollution that is costing the world the depletion of its ozone layers right now. However, technology is also the major solution for climate change. Many researches are being done on new methods of generating cleaner and safer energy other than the fossil fuel that the world was used to which cause so much damage to the environment. Wind Turbines, hydroelectric power supply and solar energy are emerging now as safer replacements. These new ways of generating energy are not only safe, they make so much power available also.

VI. Improved Standard of Living: Technology is also beneficial to the ordinary man on the street. With innovations like light bulbs, rechargeable lamps, fans, and household equipment like the washing machine, Microwave oven, cooking stove, Refrigerator etc. each person is able to lead an easier and cleaner life. Perishable goods are preserved just fine, domestic waste is curbed.

Supporting technological and organizational innovations is the way to solve environmental problems." Over the last hundred years, when serious efforts have been made to address environmental problems, the challenge of doing so has been met. In many cases environmental damage per unit of output

[14] D. Sankar Polaiah, "Impact of Technology on Environment", International Journal of Engineering Science Invention (UESI), ISSN (Online): 2319-6734, ISSN (Print): 2319-6726, Pg 53-54.

has been cut dramatically through new processes and products, and new ways of providing services and managing resources that is, through innovation. Innovation is not the only means by which environmental problems may be tackled, nor is it sufficient alone. Nevertheless, it is clear that continued and accelerated innovation will be essential if consumption growth is not to outstrip our capacity to reduce local environmental impacts, particularly in the developing world, and to tackle pressing global problems, such as climate change and continued degradation of natural resources and ecosystems. There are compelling arguments that policy must target environmental innovation more specifically and effectively if this is to be achieved."[15]

6. **Technological Change and The Environment**

The impact of rapid technological change on the environment was one of the themes chosen by the Commission on Science and Technology for Development for the 2018-2019 intersessional period during the twenty-first session in Geneva in May, 2018. To improve the understanding of this theme, the Secretariat of the commission convened an intersessional panel meeting from 15 to 17h of January, 2019 in Vienna. The other reason for this meeting is to assist the commission in its deliberations during the twenty-second session.

Big data, the Internet of things, machine learning, artificial intelligence, robotics, blockchain, three-dimensional printing, biotechnology,

[15] Dennis Anderson, Christopher Clark, Tim Foxon, Robert Gross, Michael Jacobs, "Innovation and the Environment: Challenges and Policy Options for the UK", Final Report from Workshops Sponsored by the Economic and Social Science Research Council's Global Environmental Change Program, Imperial College Centre for Energy Policy and Technology and the Fabian Society, Imperial College of Science, Technology and Medicine, Economic and Social Research Council, SBN:1 903144 01 9, Chapter 1.

nanotechnology, virtual and augmented reality, renewable energy technologies, and satellite and drone technologies are just a few of the technologies linked to "rapid technological change".[16] Because of the multidimensional, vast and absolute nature of the sustainable development goals, they may not be met before 2030 without the accurate understanding of science, technology and innovation.

Rapid technological change can contribute to the faster achievement of the 2030 Agenda for sustainable development. Rapid technological growth will have revolutionary and disruptive effects that either help or hinder sustainable development. Rapid technological advancement can hasten the achievement of the Sustainable Development Goals, but it can also widen social divides, disrupt the market and economy, and pose normative issues. By considering the direction, distribution, and diversity of innovation pathways within the framework of the Sustainable Development Goals, policymakers may be able to support new forms of innovation that avoid the economic, social, and environmental issues that arose during earlier technological eras.[17]

7. **Green ICTS**

Smart ICT applications can help optimize performance and lower inputs per unit of output in a number of supply-side domains, including industry, energy, transportation systems, buildings, and urban systems. Better information and more efficient communication also promote greener lifestyles and sustainable consumption on the demand side. For all

[16]Report of the Secretary-General, "The impact of rapid technological change on sustainable development" Commission on Science and Technology for Development Twenty-second session Geneva, 13-17 May 2019 Item 3(a) of the provisional agenda.
[17]Ibid

economies, increasing sustainable economic growth is of utmost importance. Global production and consumption rates are rising at the same time that economies and people continue to expand. Specifically, more comprehensive industrial and economic policies now incorporate green growth initiatives. Although the economic downturn and debt crises in Europe, the US, and Japan have somewhat overshadowed them, they are still a major concern in many nations and have been incorporated into national policies, albeit not to the degree that was initially anticipated at the start of the crisis.[18]

Green ICTs are those that have positive impacts on the environment either by the reduction of the physical and energy input in their production, use, disposal and recycling or through their wider application in other equipment and systems. ICTs affect the way people live and fundamentally affects how goods are produced and delivered. Though they have the potential of solving environmental problems, having numerous electronic equipment and application increases energy consumption, finishes up scarce resources and makes room for disposal and recycling challenges.

The impact of ICTs on the environment can be categorized into;
1. Direct Impact: these are called First-order effects. They may be positive or negative impacts. They generally come from ICT producers and Final consumers or users. ICT producers directly affect the natural environment during the production of ICT's and other related operations e.g., infrastructures, buildings, vehicles, logistics etc. Users of ICTs can also

[18] Graham Vickery, "Smarter and Greener? Information Technology and the Environment: Positive or negative impacts?" ISSD Commentary © 2012 The International Institute for Sustainable Development, www.issd.org. October, 2012.

cause a direct impact on the natural environment through the way they purchase, consume, use and dispose the technologies. Choosing to recycle is adopting a cradle-to-cradle approach and this is a very excellent choice that every user was made. Recycling curbs uncontrolled dumping, disposal in a landfill or incineration especially in big cities.

II. Systematic Impact: these are called third-order effects and they are rooted in behavior and behavioral change. They involve Providing and disclosing information, Dynamic pricing, enhancing real time price sensitivity, changing technologies influenced consumer and user behaviors.

III. Enabling Impact: ICTs can affect how other products are designed, consumed, use and disposed. These can happen in four main ways;
a. Optimization (Reducing other products environmental impact e.g., by achieving fuel efficient driving by investing in embedded systems in cars or intelligent heating and lighting systems etc.)
b. Dematerialization and substitution: this is the process of replacing physical products and processes with digital ones e.g., digital music replacing physical music and teleconferencing replacing business travel.
c. Induction: this occurs when ICTs increased the demand for other technologies, e.g., highly efficient printers will increase the need for high quality papers.
d. Degradation: this majorly has to do with the disposal of ICT embedded systems. Some products require specific recycling procedures or they just add to the pollution land.

8. **The Nigerian Narrative**

The economy of Nigeria is dominated by Petroleum extraction, followed by Agriculture.[19] Both the petroleum and agricultural industries has numerous environmental challenges associated with them, many of which have been mentioned in this paper. Problems instigated by technology like deforestation and erosion, pollution, depletion in biodiversity etc.

Nigeria as a nation has experienced and is still experiencing both the good and bad sides of technology. The people in the Niger Delta region are suffering a great deal from the environmental consequences of the operations of oil companies in the region. There has been a number of flooding in Lagos, a consequence of the technological activities of man on the environment. It is worthy of note however, that Nigeria has a lot of laws and regulations on the protection of her environment. Some of these laws and regulations will be considered briefly:

1. The Constitution of the Federal Republic of Nigeria, 1999 (as amended): this is the grund norm, the mother of all laws in Nigeria. It recognizes the importance of protecting the environment. Section 20 makes it a state objective to protect the air, land, water, forest and wildlife of the country. Sections 33 and 34 which guarantees the Right to Life and the Dignity of Human Persons have been argued to also extend to a right to a clean and safe environment. Finally, Section 12 of the constitution gives the basis of

[19] Available at https://esrmga.worldbank.org/program-countries/overview-environmental-legislation

the international treaties, including environmental treaties, which can be ratified by the National Assembly to become laws in Nigeria.

2. National Environmental Standards and Regulation Enforcement Agency (NESREA) Act 2007: this Act is administered by the Federal Ministry of Environment; it replaced the Federal Environmental Protection Act (FEPA). It is the focused on the protection and sustainable development of the environment. Section 27 prohibits the discharge of hazardous substances and is punishable with a fine not exceeding #1000,000 (one million naira) and an imprisonment of five years. In the case of a company, there is an additional fine of #50,000 for every day the offence persists.

Under NESREA, there are some regulations which include;
a. National Effluent Limitation Regulations
b. National Environment Protection (Pollution Abatement in Industries and Facilities Producing Waste) Regulations (1991)
c. Federal Solid and Hazardous Waste Management Regulations (1991)
3. Environmental Impact Assessment (EIA)[20]: this deals with an assessment of the potential impacts (whether positive or negative) of a proposed project on the Natural Environment. Failure to comply attracts a fine of #100,000- or five-years' imprisonment. In the case of a corporation, a fine of not less than #50,000 and not more than #100,000.
4. The Nigerian Urban and Regional Planning Act:[21] aimed at a purposeful planning of the country to avoid overcrowding and poor environmental conditions. Penalty for contravention attracts a fine of #10,000 (ten thousand naira) and in the case of a company, a fine not exceeding #50,000

[20] Cap E12, LFN2004
[21] Cap N138, LFN 2004

5. Harmful Waste (Special Criminal Provisions) Act:[22] prohibits the dumping of harmful wastes in the air, land or waters of Nigeria without lawful authority. The Penalty for this is Life Imprisonment, the Air craft or container used and in transporting it will be seized by the government.
6. Oil in Navigable waters Act:[23]This is concerned with the discharge of oil from ships contravention attract a discharge fine of #2000 (two thousand naira)
7. National Safety and Radiation Protection Act:[24] This deals with the use of radioactive substances and equipment generating ionizing radiation.
8. Water Resources Act:[25] Targeted at improving the quantity and quality of water resources. Liability attracts a fine of #2000 (two thousand naira) or six months imprisonment. An additional fine of #100 for every day the offence continues.
9. Sea Fisheries Act:[26] It is illegal to harm fishes using explosives, poisonous or noxious substances in Nigeria punishable with a fine of #50,000 or a two years imprisonment term
There are a lot of other Acts and Regulations protecting the environment in Nigeria.

9. **The Role of the Government**

Government has the responsibility to directly ensure that the design, production, consumption, and disposal of technologies do not negatively affect the environment. The challenges of global warming and environmental degradation can be tackled using ICT applications.

[22] Cap H1, LFN 2004
[23] Cap 06,2004
[24] Cap N142, LFN 2004
[25] Cap 54, LFN 2004
[26] Cap 54, LFN 2004

Policies that will tackle the environmental impact of technology should be made. Investments should be made intro cleaner and safer energy sources like the Solar Energy. Government should tackle all environmental concerns at all levels. Large environmental benefits can accrue when the government is a major producer and consumer in some sectors like the Transportation, Energy and Housing sectors because these sectors are major resource and energy using sectors. Government has a key role to play in innovation.

Lastly, there have been continuous efforts at the global level to offer frameworks to improve the beneficial effects of ICTs on the environment. For instance, a 10-point checklist on how governments might use ICTs to improve national environmental performance was outlined in the OECD (2010b) Recommendation of the Council on Information and Communication Technologies and the Environment. It emphasizes the value of governments funding R&D and innovation and promotes cross-sector collaboration and knowledge sharing on resource-efficient ICTs and "smart" applications. Governments encourage private sector investment by doing this.[27]

10. Summary of Findings

Technology is an intermediary agent of global change and not the major cause of it. The kind of technology we use, how they are designed and how we use them are actually a matter of social choice. For a proper study of the effect of technology on the environment, the natural sciences and the social

[27] Graham Vickery, "Smarter and Greener? Information Technology and the Environment: Positive or negative impacts?" ISSD Commentary© 2012 The International Institute for Sustainable Development, www.lgd.org October, 2012.

sciences must be considered side by side. This will lead into a study of the Biophysical Earth Systems and the Human Earth Systems. The Biophysical Earth Systems include five major components; the Hydrosphere, the Lithosphere (Rock and Soil), the Atmosphere, the Biosphere (living things) and the Cryosphere (frozen water). The human earth system on the other hand involves population, economic, technological and political spheres. The human earth systems relate strongly with the biophysical earth system. Unarguably, the growth and location of the world's population are the key determinants of global environmental change.

Nigeria has experienced and continues to experience both the positive and negative aspects of technology, despite the fact that the country has numerous laws and regulations pertaining to environmental protection, some of which have been taken into consideration in the body of this work. A portion of the average Niger Delta population has been consigned to a life of extreme poverty and poor health due to the detrimental effects of the petroleum industry's operations on their environment, while others are grinning to the bank.

Lagos State has had several floods recently as a result of human technological activity on the environment. It is the duty of the government to directly guarantee that the development, manufacturing, use, and disposal of technologies do not have an adverse effect on the environment. ICT applications can be used to address the problems of environmental degradation and global warming.

11. Conclusion

Information and Communication Technology (ICT) Applications have the potential to solve environmental problems and tackle climate change. To

address environmental issues, creative and sustainable methods of production, consumption, and lifestyle are required. and ICTs can and will be crucial in tackling these issues. Governments have a significant role in both directly enhancing the environmental performance of their ICT-related operations and promoting the broader use of ICTs throughout the economy to support green growth and enhance environmental performance.

Without a precise grasp of science, technology, and innovation, the sustainable development goals may not be achieved before 2030 due to their multifaceted, expansive, and absolute nature. While rapid technological innovation can speed up the attainment of the Sustainable Development Goals, it can also create normative problems, increase social gaps, and destabilize the market and economy. Policymakers may be able to encourage new types of innovation that circumvent the economic, social, and environmental problems that emerged during previous technological eras by considering the direction, distribution, and diversity of innovation pathways within the framework of the Sustainable Development Goals.

12. Recommendations

i. Government should create policies that address how technology affects the environment.
ii. Government should fund cleaner and safer energy sources, such as solar energy. All environmental issues should be addressed by the government at all levels.
iii. Nigeria being a big producer and consumer in certain industries, such as transportation, energy, and housing, can have a significant positive impact on the environment because these industries use a lot of resources and energy, the government should regulate every innovation and ensure they are not harmful to the environment.

iv. Environmental sensitization programs should be organized all over the country where citizens are educated on the need to protect the environment by avoiding bush burning, indiscriminate tree cutting and other environmentally harmful actions.

v. Every local government should be heavily invested in plant-a-tree campaigns.

vi. Environmentally safer options for cooking, transportation, household use, construction, agriculture etc. should be invested in and made available in the markets for the common man.

vii. Corporate bodies or individuals caught in any environmentally unfriendly act should be heavily sanctioned to serve as deterrence to others. In the same vein, persons that make environmentally friendly choices should be identified and rewarded to encourage others to follow suit.