Review Paper

ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE ENVIRONMENTAL PROTECTION IN NIGERIA

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Abstract

This study focused on the role of artificial intelligence in promoting Environmental Protection in Nigeria. The meaning of artificial intelligence as well as other emerging technologies were discussed. Environmental problems of the 21st century which necessitate creative and more technologically driven solutions were also discussed in line with the rationale for artificial intelligence. Recommendations were made to ensure that the problems and challenges posed by climate change and other environmental challenges can be sustainably addressed, in the face of radical global advancement

Introduction

Artificial intelligence (AI)has become a global revolution in the last decade. Almost every sector in the developed countries of the world has utilized Artificial intelligence to deepen their technological efficiency as well as escalate progress and development which in turn entrenches their global relevance. More importantly the precarious state of the global climate has necessitated the need for more creative and germane approaches to sustainable environmental development and protection. The global outcry on extinction of species, global warming and the green house effect demands that countries and nations of the world must identify alternatives to their utilization of natural resources and technological trends in order not to compromise the rights of future generations to the environment. While the concept of Artificial intelligence is not alien to Africa and Nigeria in particular, it is not clear how much it has been explored or utilized especially in areas of need such as environmental protection. This research will identify how Artificial intelligence can be utilized for sustainable environmental protection in Nigeria.

Meaning of Artificial intelligence (AI).

Artificial intelligence can simply be defined as using computers to imitate the activities of humans. According to Burns, Lawkoski and Tucci (2023) Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Rebeiro(2021) also defines AI as the field of computer science that enables machines to perform tasks requiring human-like intelligence. It involves creating intelligent agents that can sense, comprehend, learn, and act in a way that extends human capabilities. Nils(2010) opines that Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment. What is Central to all these definitions is that artificial intelligence involves the use of machines to act in human capacity howbeit, at a higher capacity. A.I. is an umbrella term for technology that performs intelligently, an adaptive

technology that allows machines to accomplish tasks in changing or ambiguous environments. Robeiro (2021) .

Sustainable development

Sustainable development is simply development that is sustainable. It is that development that can progress on a sustainable level. Such development be it in any sector of an economy or society must take cognisance of the future. Many scholars and institutions are unanimous on the definition of sustainable development Acording to the Sustainable Development Commission of the United Kingdom (2011) and International Institute for sustainable development(2023) Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. Development is usually measured by economic indices. However this is usually achieved at the expense of the environment. Every raw material required for development is a product of the environment which has made sensitization on sustainable development a global emergency. Sustainable development practices help countries grow in ways that adapt to the challenges posed by climate change, which will in turn help to protect important natural resources for ours and future generations (Steinbrink 2019).

Sustainable development is therefore development which does not compromise the future of society.

Environmental Protection

In discussing Environmental Protection one must first understand what this entity that requires protection is all about. The environment can be described as the totality of our surroundings. Josh(2016) opines that Environment is the grand total of conditions that surrounds us at a given point of time and space. It is comprised of the interacting systems of physical, biological and cultural elements which are interlinked both individually and collectively. Mondal(2022) also defines environment as the sum total of conditions that surrounds us at a given point of time and space. This means that environment is a critical aspect of human life. It is from the environment that every human operation takes place. It is therefore necessary that the environment at every point in time is conducive without which productive activities and life itself will be threatened, hence the need for Environmental Protection. According to the chartered institute of Environmental Health(2022) growing public awareness, and greater scientific understanding, of the impacts of our physical, built and natural environment on human health, have pushed environmental protection up the political agenda.

Environmental Protection refers to deliberate and intentional actions to safeguard and preserve the environment with the purpose of ensuring that activities which humans engage in for their survival does not compromise the ability of future generations to benefit from the environment. Environmental protection refers to the practice of protecting the natural environment by individuals, organizations and governments. Its objectives are to conserve natural resources and the existing natural environment and, where possible, to repair damage and reverse trends. Janardhanan (2021). The challenges of the 21st century are not unrelated to the unprecedented technological advancements within the period. It is therefore necessary that individuals and corporate entities must take responsibility for their environment through mitigating harmful environmental practices and internalizing available best practices for environmental protection. However, Environmental Protection efforts cannot succeed without an understanding of what constitutes environmental threats or problems.

Global Environment problems

Environmental problems have become a global emergency. These problems have become more prominent in the face of emerging technologies.

Rinkesh (2022) opines that with a massive influx of natural disasters, warming and cooling periods, different types of weather patterns and much more, people need to be aware of what types of environmental problems our planet is facing. All living things depend on the planet's resources to survive and, if humans continue to pollute and over-use these resources, they may be completely destroyed or depleted in a matter of years.(Tsui 2020). The environmental problems currently facing the world include pollution, soil degradation, deforestation, overpopulation, climate change, waste disposal, solar ice caps among others.(Rinkesh 2022). The United Nations Environmental Programme, (UNEP) foresight report highlighted 21 emerging environmental issues around major themes of food, land, freshwater, marine, biodiversity, climate change, energy, waste, and technology, as well important cross-cutting issues ranging from the need for better environmental governance, to the need for human behavioral change towards the environment (UNEP 2012). Study corgy (2021) outlined environmental challenges to include destabilization of the ecosystem, increasing pollution, climatic changes, and many others. The Ten Most Serious Environmental Problems according to Kerry (2022) are as follows:

Climate change
Loss of biodiversity
Phosphorus cycle
Nitrogen cycle
The water cycle
Ocean acidification
Chemical pollution
Atmospheric aerosol pollution
Land-use changes
The stratospheric ozone layer

While Kerry may not be wrong in outlining the above as the most serious environmental concerns, the list cannot be complete without other equally disturbing environmental issues such as deforestation and water pollution which are prominent in Nigeria. Perhaps the most popular of these issues is climate change. Climate change can be defined as long term shifts in weather temperature or weather patterns. This is usually the effect of emission of green house gasses into the ozone layer. The United Nations reports that human activities since the1800s have been the main driver of climate change as a result of burning fossil fuels of coal, oil and gas.

These are natural resources needed to meet global economic needs. However, as a result of the threat to mankind other alternatives to these natural resources have been sought, the result of which is evidenced in the current technological revolution, especially in developed countries of the world.

The radicalization of technology in first world have not been without unpalatable implications for their third world/underdeveloped counterparts. For instance in the course of regurlarly updating their technology many obsolete machines are shipped to Africa, sometimes in deplorable conditions. Utoikamanu (2018) posits that tremendous technological leaps are being made, but the economic and social benefits remain geographically concentrated, primarily in developed countries. Too often the least developed countries (LDCs) remain far behind if not excluded entirely. Many have little choice beyond the use of obsolete technologies, such as those used in the garment or agricultural sectors.

Environmental problems in Nigeria.

Nigeria, popularly referred as the giant of Africa has been battling a myriad of environmental challenges. These challenges include but are not limited to the following: Water pollution, air pollution, deforestation, over population,

Poor hygiene, desertification, flooding and loss of biodiversity. According to Omofonmwan, & Osa-Edoh, (2019) Nigeria has a total land area of 983,213 km2 occupied by about 120 Million people: The interaction of these millions of people with their environment has left indelible mark on the landscape. Urbanization, deforestation, desertification, over population and all kinds of pollution are some of the

resultant effects of man's interaction with his environment.

These changes are orchestrated by people's attempt to meet up with their basic survival needs. The effects of this interaction is far reaching. World bank (2022) reported that increasing climate variability in Nigeria is causing more intense and untimely rainfall. Adding to land degradation, flash floods, landslides, and gully erosion have worsened across one of the ten most vulnerable countries to climate change impacts. There is need therefore to urgently address these challenges in a cost effective and smart manner. One way through which this can be achieved is by deploying Artificial intelligence to reduce the overt interaction of man and the environment while achieving greater economic results.

Artificial intelligence (AI) for Sustainable Environmental Protection.

In the face of debilitating environmental degradation in Nigeria the need for practical intervention cannot be overstated. Politicization of critical issues has always been a hindrance to sustainable national development in Nigeria. It is therefore important to leverage on the ease provided by artificial intelligence to promote sustainable environmental protection. This can be achieved through the following, among others:

1. Replacing fuel driven machinery with solar and electronic alternatives. In the developed world where clean energy has become the focus, there is a radical phasing out of machinery which are run by fossil fuels. Electric cars are gradually becoming the order of the day. Reducing the demand for fossil fuel will do our environment a world of good. With the rise of companies like **Tesla** and increasing gas prices, more companies are paying closer attention to the EV (Electric Vehicle) market. In 2021, gas prices hit the highest average nominal price since 2014 due to rising crude oil prices and increased demand for gasoline. (Tehrani, 2022).

2.Using virtual reality as instructional materials in the school system. Virtual reality is the term used to describe **a three-dimensional, computer-generated environment** which can be explored and interacted with by a person. That person becomes part of this virtual world or is immersed within this environment and whilst there, is able to manipulate objects or perform a series of actions. Virtual reality society (2022). Virtual reality can therefore be used to teach different categories of learners about the catastrophe that is inevitable if conscious steps are not taken to mitigate the harmful effects of some unhealthy human activities on the environment.

3.Utilizing machine learning to curtail the effects of climate change. According to Bouni(2021) Studying the climate and identifying high-risk areas require large amounts of data, ranging from images to sensor data. Machine learning algorithms can help mitigate and manage climate change effects by improving the accuracy of global climate models and predictions.

4. Use of drones to track bunkering and deforestation.

5. Use of internet of things, machine learning and bloc chain technology for urban water management.

6. Using AI based technology to enhance Agricultural practices (smart farms).AI-based technological solutions can enhance the sector's resource efficiency by reducing the use of land, water, fertilizers, and pesticides while also enhancing output quality and ensuring a faster time to market for produced commodities.(Bouni2021).

7.Using AI to foster domestication of Renewable energy. Renewable energy has the potential to reduce the power problem in Nigeria which fuels the demand for personal and corporate power generators. Continued eppileptic power supply translates to a high demand for fuel and contributes to noise pollution which is prominent in most urban areas of Nigeria. According to Tehrani (2022) artificial intelligence can apply powerful predictive capabilities and intelligent grid systems to manage the supply and demand of renewable energy.

Conclusion

Artificial intelligence is the new order. It is the cost-effective technology that has the potential to bring ease to mankind in every aspect of life. With the devastating effects of climate change and other drivers of environmental degradation there is need for intentional actions to reverse this trend. The lip service paid to environmental protection must there for give way to pragmatic solutions. These solutions cannot be sustainably implemented without the application of emerging Technologies of the 21st century, chief of which is Artificial Intelligence.

Recommendations

1.The government of Nigeria must take steps to invest in radical capacity building of its work force in AI technology.

2. AI technology/education should be entrenched at all levels of Education in the country.

3.Private sector investors must scale up investments in emerging technology by keying into AI evolutions.

4. Civil society and nongovernmental organisations should increase advocacy on environmental protection and utilization of automated machinery to facilitate clean energy.

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