The Political Economy of Digitalization and Climate Change Response in Nigeria

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Abstract: Climate change is having serious impacts on the sustainability of the world. Growing scientific exactitude on causes and effects of climate change makes humanity's response to it an urgent and critical need. Nigeria like many countries around the world is facing difficult times owing to the new environmental realities produced by the menace. Responding to climate change requires humanity's best social, political, scientific, and technological efforts. To achieve this, this paper notes that digitalization can be a veritable climate change response tool in Nigeria. Dwelling on Schumpeter's theory of innovation and the political economy approach, the paper argues that digitalization holds positives for Nigeria's hitherto unimpressive climate change response but may not be practicable due to the social, economic and political contradictions that are producing unfavourable outcomes within the Nigerian state. This situation explains why mitigation and adaption efforts have not produced satisfactory results, a situation that puts citizens' wellbeing in harm's way in critical areas such as agriculture, housing, healthcare, and energy among others. The paper concludes that digitalization would make mitigation and adaptation wholesome and enhance the adequacy of climate change policies and programmes towards sustainable development in Nigeria. It then comes up with policy suggestions that can help mainstream digitalization as a tool for climate change response in the country.

Keywords: Climate Change, Digitalization, Adaptation, Mitigation, Development, Nigeria.

INTRODUCTION

The severity of the effects of climate change shows that humanity needs to treat the phenomenon with urgency in the quest for solutions to the menace. It also demands creativity and innovativeness in the ways the solutions are to be found. This is because climate change affects many sectors of the economies of countries across the world. Due to its nature as an effect multiplier of the existing environmental and social problems, climate change response needs to be multilateral, multi-sectoral, and multi-modal. Climate change response is a problematic endeavour due to its many issues. A key issue militating against good climate change response is the absence of adequate tools for planning and implementing programmes and policies on mitigation and adaptation. This is especially true in developing countries which have been predicted to feel the impacts of climate change the most.

One tool that can come handy in climate change response is digitalization. Balogun *et al.* (2019) note that digitalization is provides opportunities that can help in adaptation planning and programmes. The need to come up with effective strategies to ensure ease of planning and implementation of development targets makes digitalization an allure in the contemporary political economy. This portends that it is an enabler and facilitator of climate change response which can make the human society sustainable (Sommaberg, 2016; Di Silvesre *et al.,* 2018; Balogun *et al.,* 2019). Digitalization has proven of good utility across many sectors of the economy by ensuring competitiveness and innovation in the ways of doing things and this has wrought better results in businesses and ventures that have adopted it (Zimmermann, 2016). Hence, climate change response stands to benefit from an alliance with it.

Climate change is a huge reality in Nigeria (Olajide, Quadri, and Ojakorotu, 2018), like the rest of the world, there are alterations in environmental indices and reality in the country. The imprints of climate change are felt across the country due to massive desertification and the presence of a long coastline. The Nigerian Meteorological Agency (NIMET) observed temperature increase in Nigeria between since mid-twentieth century (Olajide, Quadri & Ojakorotu). This and other observed indices like hail, onset, and cessation of rainfall are responsible for variations in environmental patterns across the country. Climate change has been found to have not just geographic impacts in Nigeria, it also has sectoral, demographic, and security impacts (Heider, 2019). These impacts have served to worsen Nigeria's gory scenarios of development as citizens are thrusted further into crisis owing to the intensification of the impacts.

Given the reality and impacts of climate change in Nigeria, the country like the rest of the world has found

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it necessary to respond to it. This has to do with both mitigation and adaptation policies and programmes. The essence of climate change response is that life can be good and sustainable for the people. As a result, getting the requisite tools for climate change response becomes an important task. This paper explores the utility of digitalization as a tool for climate change response in Nigeria. With modest inroads into the various sectors of the Nigerian economy, the accruals in benefits of digitalization hold potentials for the transformation of Nigeria's climate change response. The crux of this paper, therefore, is that digitalization despite its many obvious potentials at bettering Nigeria's climate change response may be tenuous owing to a climate of development that is more or less inimical to digital transformation.

This paper is divided into seven sections. Section One offers an introductory outlook of the paper while section Two deals with the review of the concepts of digitalization and climate change response and attempts to build a nexus between them. Section Three explores the theoretical assumptions of Schumpeter's theory of innovation and the political economy approach. In Section Four, the authors analyse the reality and impacts of climate change in Nigeria. Section Five is dedicated to the discourse of the political economy of digitalization in Nigeria by looking at possible issues that may make digitalization arduous in Nigeria. Section Six discusses the import of digitalization for climate change response in Nigeria and section Seven is the conclusion of the paper.

DIGITALIZATION AND CLIMATE CHANGE RESPONSE: CONCEPTUAL CLARIFICATION AND NEXUS

The search for ease and improvement in ways of doing things is an ongoing affair. Given this fact, man adopts creativity and innovation to solve societal problems. A major feature of the Fourth Industrial Revolution (4IR) is digitalization with its many benefits not just for the ways of doing things but also for an unprecedented improved face of human development. This improvement is felt from business to interpersonal relations and governance, digitalization has brought about a new about a world that is ever dynamic and changing.

Digitalization has been defined as the mass adoption of connected digital services by consumers, enterprises, and governments (Sabbagh *et al.,* 2013). Urbach and Roelinger (2019) point out that digitalization has to do with the adoption of digital technologies in business and society along with the changes in the connectivity of individuals, organizations, and objects. Digitalization brings about changes through new set of technologies that altogether transform the face of human activities to produce improved results. Gartner opines that digitalization entails the use of "digital technologies to change a business model and provide new revenue and value-producing opportunities". The production higher values for both producers and consumers of goods and services speaks to the whole concept of the Fourth Industrial Revolution which is all about the movement to digital business (Di Silvestre *et al.,* 2018)

A Report by PwC notes that digitalization is the main driver of the Fourth Industrial Revolution because it has changed the face of the supply chain of goods and services (Scantrust, 2020). In the same vein, Brennen & Kreiss (2016) define digitalization as "the way many domains of social life are restructured around digital communication and media infrastructures" (p.1). Digitalization, through the combination of many technologies, portends a leap in results and values. It is an important driver of the economy and also accelerates growth and help in the facilitation of job with an economy (Sabbagh, 2013). The utility of digitalization is well registered in the business world as it has been established that businesses that adopted it. Sommaberg (2016) avers that digitalization touches knowledge production and value in a new way and has emerged a very strategic tool for firms.

Among the technologies of digitalization, cloud, internet of things and mobile are the most revolutionary which makes the former the hub around which the contemporary economy and society revolve. In this wise, through the convergence of digital technologies, businesses, and society and even nations can leverage on the political economy information. Manuel Castels (2010) cited in Brennen and Kreiss (2016) assert that 'digitalization invokes information as the organizing principles of the several domains of social life' (p. 6). With this, the convergence of technological platforms and their information can serve the good of humanity and this has been touted in literature as capable of inspiring among other things, political participation and collective action.

Innovation and more importantly digital innovation that is brought about by digitalization is useful in every aspect of social life, helping to solve problems, one

which is climate change. This means that digitalization can serve the purpose of climate change response. In definitional terms, climate change response refers to actions and strategies to be taken to address climate change. According to the US Global Change Research (2020), climate change response involves "actions to prepare for and adjust to changing climate conditions—thereby reducing negative impacts or taking advantage of new opportunities". Climate change response falls into two categories according to the United Nations Framework Convention for Climate Change (UNFCCC) (UNFCCC, 2011). One, climate change response involves actions, programmes and strategies that are capable of reducing the emission of Greenhouse gases which are the main cause of global warming, that is, mitigation. Two, actions, programmes and strategies that are aimed to ensure that the people can cope with the changes wrought by climate change, which is known as adaptation. The Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2018) puts this in perspective as it defines adaptation as "adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effect" (p.1758). It also defines mitigation as "a human intervention to reduce the sources or enhance the sinks of greenhouse gases" (p. 1769). Climate change response through adaptation and mitigation is intended to make the world a more habitable space for its occupants, man, flora, and fauna.

The improved environmental ambience of the world can only be achieved through a balanced application of strategies on adaptation and mitigation. Adaptation and mitigation are complementary approaches in that mitigation without adaptation would be meaningless because changes brought about by climate change would continue to afflict the people. In the same vein, adaption without mitigation would make the former most arduous as it would be difficult to measure its impact. Adaptation without mitigation would be impracticable because it would result in a vicious cycle of increased warming of the earth and the tolls on human life and the social process would be incalculable. Bosello, Carraro & De Cian (2010) in light of this call for an accurate and well-measured combination of adaptation and mitigation programmes and strategies. As a result, adequate and non-discriminatory allocation of resources should be focused on adaptation and mitigation across the world, while the former is more needed in developing countries.

Climate change response plans and strategies require humanity's best approaches. These approaches also have to be evolving and making use of the world's state-of-the-art technologies. This is where digitalization becomes handy to climate change response. As an innovative approach to problem-solving, adapting digital technologies to climate change mitigation and adaption holds promises for the world. Van der Velden (2018) notes that digitalization technologies are enablers of sustainable development. With its potential for political participation and collective action, digitalization comes to the fore as being capable of creating new values and improved results in climate change response.

THEORETICAL FRAMEWORK

This paper is anchored on Schumpeter's theory of innovation and the political economy approach. Innovations are essentially problem-driven regardless of the context in which they are created, the melting point is usually the problem intended to be solved or newer processes that improve effectiveness and efficiency from the older stock. It involves new ideas, new steps, mutations, new methods which correspondingly results in newer ways of problem-solving. While technology-based innovations have witnessed an all-time rise in an ever-changing world of globalization, climate change is not left out as one of the areas in which its processes can outrightly tend to. Technology-based innovations include product innovations, research and development investments and technology transfers through imitations and improvements (Sengupta, 2014) this can also include technology diversification to include areas for which technology was not originally thought out from but rather adopted in line with the application of innovation processes to problem-solving. The impact of innovations especially in the aspect of technology has political and economic significance, as it helps to solve societal problems such as climate change and make these solutions accessible to be further improved on; thus a combination of access and efficiency in terms of policy direction.

Schumpeter in his work published in 1939 focuses on intellectual creativity. This theory provides an economic dimension towards the digitalization of climate change. Schumpeter identifies innovation and entrepreneurship as important for economic progress

which had policy implications. However, despite his statement that large enterprises could afford to gamble with newer techniques of innovation, this does not only pertain to large enterprises but rather could be applied to both private and public sectors. Previous classical scholars before Schumpeter had ignored the major role that creative abilities could portend for economic development; this was the gap Schumpeter had to fill with his introduction of the theory of innovation. His definition of innovation meant "doing things differently in the realm of economic life" (Schumpeter, 1939). He argued that innovations were significant if economic growth would thrive. Thus, being static would be unbeneficial to capitalism. The dynamism of his theory lies in the albeit focus on innovations in the technological aspects which makes it easier for his theory to transcend beyond the context in which it was written and apply to issues such as Climate Change. Using Schumpeter's concepts of innovation, technological advancements could aid addressing the issue of climate change while his concept of mutations can ensure that these innovations are disseminated in such a way that climate change responses become accessible. Newer waves of innovation in the area of climate change are more needed than the benefits of older ways of combating climate change in Nigeria have proven ineffective and need to be replaced by a newer form. Hence, innovative strategies based on digitalization as climate change response tool is synonymous to the phenomenon Schumpeter describes as "creative destruction" in an environmental dimension. This will drive more effective climate change responses, informed policies for better development indices.

The political economy approach, on the other hand, lends itself understanding in the aspect of the nexus between politics and economics towards the digitalization of climate change responses. Political economy takes into consideration, goals, interests, institutions, and actors. While the economic aspect focuses on efficiency, growth, and stability, politics focuses on equity and social order (Clark, 1998). Politics occurs in the government arena while economic activities are largely market-based. The government engages in a series of exchanges and correspondingly functions as an economic agent to achieve public goods using resources (Clark, 1998). Thus, just as the market possesses political aspects, so also does the politics possess economical dimensions. They both crisscross each other in such a way that separation of these two concepts would create a gap in the analysis. The political economy approach combines the rationality of economics in terms of allocating resources with the capability for making informed decisions based on an aggregate of general interests. The political economy approach takes into cognizance not only the linkage between politics and the economy but also the forces that each of them generates and how they seek to balance out each other's efforts. The interdisciplinary approach lends itself as a framework for analyzing climate change responses in an era where public and private differentiations are constantly been reviewed to improve the quality of human life.

The political economy approach fills in the innovation gap that limits itself to the creation of climate change solutions while neglecting the vested interests, incentives, gains, and losses that surround confronting modern-day environmental problems such as climate change. From the dimension of Modern Liberals such as John Rawls, advocacy has been for governments to have a theory of justice i.e. principles that guide public interest to make the government less susceptible to demands of more powerful groups at the expense of others. The implication of this is that when issues such as climate change occur and the actions of the government are lukewarm towards addressing the issues, resources that would have otherwise been directed towards climate change are diverted to fulfil the needs of other vested interests within and outside government. In essence, government activities towards climate change can be objective when vested interests are subsumed for the public good. From the Modern Liberal perspective, the role of the government is that of machinery through which public goals such as combating climate change are pursued collectively as they are unachievable individually. Thus, the government is viewed as a benevolent administrator and impartial defender of public interest (Clark 1998)

Just as climate change has its adverse resultant effects on the government and the people, the Political economy approach guides in explaining the geopolitics and economics of climate change in Nigeria. This ranges from climate change policies, necessary resource allocation to where factors such as governmental structure, interest groups, and political accountability affect the political economy of policymaking (Steves & Teyteboym, 2013).

ANALYZING CLIMATE CHANGE AND ITS IMPACTS IN NIGERIA

Climate change involves a long-term and serious change in weather dynamics such as average

temperature, precipitation and wind patterns of a place (Mosha, 2011) This change among other factors are largely caused by the activities that humans engage in such as the production of carbon dioxide, nitrous oxide, and methane which are greenhouse gases that harm the environment.

Climate change is felt in the society and the environment through diverse means, from drastic weather changes to the outright omission of albeit regular weather trends. These changes have a reverberating effect on the different sectors of the society such as how the changes in rainfalls can affect agricultural production and equally affect energy production and supply. Though the problem of climate change is common to countries of the world, its effects differ to a large extent. Which in turn determines the level of mitigation and adaptation processes which is adopted in various climes. As climate change effects continue to threaten humanity, further problems such as sea level increase, temperature increase, flood, droughts, desertification will equally impact food supply, water management, and biodiversity in general. Even though Africa contributes only 3% of the world's total emissions of greenhouse gases (Hope, 2011) yet its impact is largely felt the most in African countries of which most are less developed and have poor climate change strategies. In low industrial countries such as Nigeria, the livelihoods of rural peoples have been severely affected by the menace which has seen a steady rise in rural-urban migration correspondingly increasing strains on urban centres. This has led to overcrowding and an increase in poverty levels.

In Nigeria, the mean yearly temperature is projected to increase by 1.1 to 2.5 degrees Celsius by 2060 and 1.4 to 4.6 Celsius in the 2090s. A greater part of this warming and length of heat waves is projected to occur in the Northern part of Nigeria. Projections also indicate an increase in the mean annual precipitation in Nigeria while heavy rainfalls are also predicted to occur in West Africa (World Bank, 2020) In terms of food security, climate change is projected to lower food production such as cereal in Nigeria considerably (Hope, 2011) also, fish supply in areas such as Niger Delta are already being threatened by oil pollution and climate change is predicted to further cause a reduction in fish production levels. The agricultural sector which contributes a substantial amount to the Nigerian GNP is heavily affected by climate change. Access to food and the availability of food is of immense importance for any population and with major food deficits alongside plans for self-reliance, climate change continues to affect food security levels. Water availability will also be affected due to the predicted alterations in precipitation. This will not only affect agriculture but is also detrimental to power generation. Low levels of power generation have been witnessed in Nigeria's hydropower stations in Kanji, Shiroro, and Jebba; this is due to the affected water levels. Deficits in the water supply are extremely dangerous and serve as a danger to food security and energy generation in Nigeria. Based on the impact of climate change on health in Nigeria, diseases like Malaria which is prevalent are rising due to the high temperatures which lead to an extension of mosquito habitats. Floods unattended are also likely to serve as new breeding grounds for mosquitoes and increase the levels of malaria disease in Nigeria. This has both health and resource implication for the country especially for rural areas where access to adequate health services are severely limited.

General trends and predictions for Nigeria have been largely unfavourable and require urgent government attention ahead of a hopeful future of sustainability. The Nigerian government as many other world governments are allocating resources to address the problem of climate change but with little to show for it due to data dearth. The focus of the government has mainly revolved around strategies of adaptation on climate change issues and with little progress on implementing effective mitigation strategies in managing the risks of climate change in different aspects of the society. However, there remains a high demand for statistics and data which reflect the state of the natural environment and its impacts on the society (Zenchanka & Gorbatchev, 2019) As climate change continues to pose high levels of risks in Nigeria despite her low contribution to it. Low adaptation and mitigation strategies will see a steady rise in these risks; therefore the government needs to focus on policy implications and begin to map out strategies to address climate change impacts. These policies should adopt a dual-mode with focus on rural and urban areas but with an emphasis on rural areas as they have a domino effect on the urban areas. Nigerian climate change adaptation must focus on the human factor and gathering data not only on the environment but on health, population and general human activities. Adaptation strategies need to also go beyond national planning but be decentralized in such a way that data gathering begins at the local government level and is gradually scaled up to the state level before it gets to the national level. National governments will then focus

on mainstreaming issues of climate change, moderating climate change activities at the state level both in rural and urban areas, harmonizing large volumes of data gathered from various government levels, using these data to map out better adaptation and mitigation strategies and accessing the overall impacts of these activities on climate change for further development. This will ensure that the relevant amount of data is collected for climate change planning for the general population.

Efforts towards combating climate change in Nigeria have passed through steps- the international level and the national level. Various African governments including Nigeria have been party to international conventions to engage the climate change challenge- these include the Ratification of Kyoto protocol, taking part in the United Nations Convention on Climate Change, United Nations Conference on Environment and Development, and the United Nations Convention to Combat Desertification. This meant that governments of the world had realized the need for joint effective action on climate change. This means that newer goals have been set to be domesticated for land and water management to address climate change issues.

On the national level, policies such as the National Policy on Drought and Desertification (using climate data to reduce desertification), National Biodiversity Strategy and Action Plan, National Forest Policy amongst others, have been enacted to address climate change. The Federal Ministry of Environment was established in 1999 to address issues of climate change in Nigeria. This ministry is responsible for the coordination of climate change response activities and the implementation of treaties and protocols. Government policies towards climate change signal a plan of action and processes to reduce the causes of climate change. This includes a series of actions to be taken towards climate change response. However, climate policy is not independent of the politics of climate change which revolve around the concerns on climate change, its overall implications will ultimately determine the volume of resources that should be allocated towards its cause. However, the economy of climate change does not only cover resources allocated but resources generated due to production processes which increase climate change effects. Most African countries that are barely technologically advanced will have limited options in cheaper techniques for production and energy technologies which contributes to an increase in greenhouse gas despite the low levels of contribution towards the menace of climate change. Consequently, this has impacted government levels of commitment and transparency. The Nigerian government requires more strategic innovations to tackle the menace of climate change in her overall development planning. Climate change seems to keep attracting the least of attention in terms of resources, relevant policies, and strategies despite its gradual devastating effects on the environment and economy. In a technologically advancing world, the Nigerian government will need to focus on adequate data gathering and storage from all levels of government and utilizing this data to mitigate climate change effects by enhancing climate change policies and programmes.

DIGITALIZATION AND CLIMATE CHANGE IN NIGERIA: THE ISSUES

Climate change is a global emergency that requires the best of attention from politicians, scientists, civil society, and other stakeholders. Digitalization, on the other hand, speaks to innovation in governance, commerce, and other critical spheres of human life. Nigeria stands to benefit immensely from digitalization due to its enhancement of value-creation and a total transformation of several aspects of social life. Having been posited as a utility for sustainable development, digitalization needs to be taken more seriously than ever in the country (van der Velden, 2018). While this position is aspirational, there are quite several roadblocks to Nigeria's embrace of digitalization towards improved climate change response.

The first issue standing in the way of digitalization for possible climate change response is funding. Digitalization is a capital-intensive endeavour and one that involves many processes that require a huge injection of resources. Resource allocation is a problematic aspect of Nigeria's political economy. This is due to the many contradictions that are afflicting the country. The country has a well-noted history of poor funding of the avenues through which digitalization can spring forth. For example, government spending on science and technology is one of the lowest budgetary allocations in Nigeria. Budgit (2017), Muanya (2019) and Olamilekan (2019) note that in the fiscal years 2017, 2018, 2019 and 2020, budgetary allocation to the Federal Ministry of Science and Technology was 0.89%, 0.73%, 0.76% and 0.78% of the total budgets respectively. With this situation, climate change response which can be immensely aided by digitalization becomes difficult because the latter is not

adequately funded in the country. It is quite ironic that digitalization has been recognized as one of the ways by which Nigeria can make her economy more competitive. The Economic Recovery and Growth Plan 2017-2020 (ERGP) holds digitalization as a key strategy (World Bank, 2019). Because of the paltry allocation to science and technology, the targets of the Plan may not be achievable.

Following the issue of funding is the insufficiency of digital infrastructure is more or less a function of the former. Digital infrastructure is needed for digital technologies to function. In line with general infrastructural rot in Nigeria, digital infrastructure is at its lowest. In the country, broadband infrastructure and rural connectivity are very low (World Bank, 2019). Internet penetration into Nigeria has grown tremendously in recent decades, however, due to digital infrastructure deficit, in rural and semi-urban areas in the country, there is a lot to be done. This is responsible for the digital divide that is said to be widening in the country (Economist, 2016). An implication of the digital divide between rural and urban areas is that farmers may not be able to practice precision agriculture, that is, practising agriculture without necessary digital technologies. Hence, climate-smart agriculture might not be immediately practicable in Nigeria. Another critical aspect of infrastructural deficit that could hamper digitalization in Nigeria is inadequate power supply. Despite the availability of different possible sources of power in the country, the country remains enmeshed in an energy crisis. Apart from power, other forms of infrastructure such as roads among others need to be provided to aid Nigeria's access to digitalization, especially in rural areas.

Political will is an important issue in the quest for digitalization because it speaks to government policy and the energy and passion that are brought to achieve policy goals and targets. The Nigerian government has come out to emphasize the need to adopt digital technologies in different aspects of her national life but this has not been matched by the requisite political will. At a recent international gathering, Nigerian President, Muhammadu Buhari pledged to invest more in research, science, and technology so that the country can derive benefits to digitalization which comes from innovations in science and technology (Shehu, 2020). This hope is not hopeful due to meagre allocations in the past years and weak and non-inclusive policies on education, science, and technology (Olajide, Ogunnowo & Ojakorotu. 2019). In the same attempts by the Nigerian Government at revamping technology, communication, and related activities have been at best cosmetic. The recent renaming of the Federal Ministry of Communications was changed to the Federal Ministry of Communications and Digital Economy has led to the questioning of whether the government can match principle with practice (Paul, 2019). This pessimistic outlook is borne out of the fact that name change alone cannot bring the desired result, rather the investment of political will by the government which changed the Ministry's named to remove the limitations perceived in its operations (Paul, 2019).

Institutional coordination to bring about digitalization in Nigeria has a bleak outlook. This is because the different institutions on which digitalization depends lack policy coordination. Some of the institutions include the Federal Ministry of Communications and Digital Economy, the Federal Ministry of Science and Technology, the Federal Ministry of Education, Federal Ministry of Environment, Federal Ministry of Agriculture, and to some extent the Federal Ministry of Youths and Sports. These Ministries and their several Departments and Agencies operate based on policies that have to do with Nigeria's digitalization quest. A perusal of Nigeria's policies of science and technology, education, and youth shows that these institutions work parallel to one another (Olajide, Ogunnowo & Ojakorotu, 2019). Institutional and policy coordination of the four Ministries would ensure that the quest for digitalization leaves no gap in functional terms and makes it serve as a real driver of socio-economic advancement. Lack of institutional and policy coordination among government institutions in the country will hurt the country's adaptation and mitigation targets, which brings to fore the multi-sectoral need for climate change response.

The Digital skills gap in Nigeria is wide. Digital technologies require functional education policy background which in Nigeria is problematic. The guiding philosophy of education in Nigeria as enshrined in the National Policy on Education only made some passive reference to digital training via science, technology, and vocational education (Olajide, Ogunnowo & Ojakorotu, 2019). All aspects of Nigerian education is bedevilled with one crisis or the other. The World Bank (2019) avers that Nigeria's education standards are low with all levels suffering from poor funding and poor teaching offerings. The inability of the political class to invest qualitative mass education that contains a good dose of digital training means that the country lacks the right kind of people to man her

digitalization quest. This brings to fore climate change response which is supposed to be participatory because as a collective action, citizens require basic digital skills to make to use digital technologies for climate change purposes. This will affect almost every aspect of climate change response.

ON DIGITALIZATION AND CLIMATE CHANGE TOWARDS SUSTAINABLE DEVELOPMENT IN NIGERIA

Climate change's grim reality in Nigeria needs to be responded to with the best technological efforts. This stands digitalization out as a potential tool for climate change response. While the potential utility of digitalization is well-recognised in the country, it has not received the best of efforts. This is due to the issues raised above among others. As an interface of digital technologies across different facets of social life, digitalization is capable of bringing sustainable development to Nigeria due to the potential improvement it can bring into the climate change response. Nigeria's climate change response cannot be said to be the best the country can do. Olajide, Quadri & Ojakorotu (2018) assert that Nigeria's climate change response, which is at the heart of environmental governance needs to be improved. Given this reality, the potential contributions of digitalization to climate change response need to be analysed as it can be of help in climate change response in three major areas, which are monitoring, adaptation, and mitigation (International Communication Union, 2019).

Digitalization can be a tool for climate monitoring. Monitoring helps to be abreast of changes in climate dynamics. International Communication Union (2019) notes that digitalization can help in the monitoring of the ecosystem, food security, water transport, and supply and deforestation and forest degradation. The deployment of satellites and other digital technologies can help in climate change policy formulation and mapping programmes and strategies to bring about climate resilience in Nigeria. Climate monitoring helps in the generation of climate data which in turn helps to capture the full extent of the effects of climate change. Munang, Nkem, and Han (2013) posit that digitalization can help in generating historical data for climate change. This data helps in understanding, assessing, and predicting climate dynamics over medium and long-term and the development of climate products, applications, and services. Hence, there is a need for government agencies in Nigeria to come to the appreciation of digitalization for greater precision and decisiveness on climate dynamics. Digitalization will also help in proper archiving of climate data, as data storage and retrieval has been a fundamental problem in Nigeria and this has had dire consequences for policymaking in the country. Through digital technologies like cloud computing and related ones, environmental policymakers can be able to access climate data also gathered through the deployment of digitalization.

Digitalization can aid climate change mitigation in Nigeria. While the country is a low carbon emitter alongside other African countries due to low-level industrialization, the country is one of the highest emitters in the continent. As a result, some commitments should be made to mitigation of which digitalization can be of good value. Mitigation is needed in areas such as energy, transportation, buildings, industry, agriculture, forestry and land use, human settlement, infrastructure, and spatial planning (International Telecommunication Union, 2019). These areas will benefit from digitalization in Nigeria because digital technologies will ensure that new ways of doing things in these areas of endeavour. In the area of energy, digital technologies can be deployed towards the production of renewable energy in the country. With the challenge of poor electric supply in the country, the Nigerian economy which has a 20,000 MW demand is undermined (Sunday 2020). Hence, the transition to clean energy will be assured in the country. Digitalization can also aid the country's quest for an efficient multi-modal transport system. This will have an immediate impact on emissions across the urban centres in the country.

Adaptation is the livewire of climate change response because it is at that level which citizens can feel and assess the impact government policies and programmes on climate change. Hence, digitalization is critical to the success of adaptation policy implementation. Digitalization can aid climate change adaptation in terms of knowledge sharing and awareness creation on the menace (International Telecommunication Union, 2019). It can also be of help in the early-warning system and disaster management. The mobile aspect of digital technology has found great penetration in Nigeria. The mobile can be a veritable digital tool for adaptation because it is enabling new business scenarios, while social channels are transforming the ability to connect with customers quickly, directly and cheaply" (Di Silvestre *et al.,* 2018 p. 486). Forenbacher *et al.* (2019) state that 71% of

Nigeria's almost 200 million use mobile phones with 89.79%, 62.05%, and 11.04% percent of the population being able to assess the internet with 2G, 3G, and 4G signals respectively. As a result of this, adaptation through the sharing of information can be of help in agriculture, the largest employer of labour in Nigeria to bring about climate-smart agriculture. With this, Nigerians from the Arid North and Coastal South will be able to live with and be most minimally affected by the effects of climate change, even in times of disaster as policymakers can interface with citizens in a more quickly, effectively and cheaper manner.

CONCLUSION AND POLICY RECOMMENDATIONS

Climate change is real in Nigeria and requires the country to come out with her best response strategies in terms of mitigation and adaptation. There is arguably no part of the country that is not vulnerable to climate change. Digitalization has been mooted as a potentially result-oriented response to climate change. The political economy of digitalization towards climate change response is impacted upon by fundamental issues that would not allow for the fruition of the offerings of the former. Digitalization is a fact of contemporary times and it is already being harnessed across the world with improved mitigation and adaptation results. Nigeria must deal with the issues that could make the appreciation of digitalization untenable for climate change response, the unwanted addition to the country's social process.

Flowing from the above the following policy recommendations are suggested for Nigeria

i. There should be harmonization of policies that have a direct linkage to digitalization. These policies include policies of communication, science and technology, and education to deal functional gap in climate change response through digitalization;

ii. There should be a mass orientation of Nigerians towards the benefits of digitalization and the roles it can play in climate change response

iii. Digital skills should be mainstreamed into the nation's educational system. This will bridge the digital divide in the country and allow citizens to tap into the benefits of digitalization especially in adaptation.

iv. Female-folk should be purposively recognized in the digitalization policy framing as they are the most-hit group by the effects of climate change. They also form the majority among Nigerian's that will benefit from climate-smart agriculture.

v. Nigeria should come up with a Digitalization Fund that can be of help in building digital infrastructure which will subsequently aid climate change response.

vi. The government should match principle with practice by increasing allocation to the institutions on digitalization and encourage coordination and close interactions with environmental institutions so that climate change response can benefit from digitalization maximally in the country.

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