

## NATIONAL BIO-ECONOMY POLICY: A ROUTE TO PROMOTE SUSTAINABLE GROWTH AND DEVELOPMENT IN NIGERIA

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### ***Abstract***

*The objective of the bio economy is to combine economy and ecology to ensure a more sustainable use of biological resources, Nigeria will continue to surmount the challenges of economic growth and development as much as we continue to explore new and innovative ways to utilize our natural resources and biodiversity. The National Bio-economy Policy in Nigeria is an important step in this direction, as it aims to promote sustainable economic growth and development by creating a bio-based economy that will contribute to the creation of jobs, poverty reduction, and increased access to food and energy. The Bio-economy Policy will also promote the development of new technologies and innovations to increase the efficiency and sustainability of bio-based production systems. Additionally, the policy will work to ensure that the benefits of the bio-based economy are shared equitably among all stakeholders, including smallholder farmers, rural communities, and indigenous peoples. The National Bio-economy Policy has the potential to be a game changer for our country, as it will enable the nation to harness the full potential of our biological resources and biodiversity. Finding showed that with the implementation of this policy, we will be able to create a more sustainable and inclusive economy that will benefit all Nigerian stakeholders to support and actively participate in the implementation of this policy, as it is a crucial step towards building a more prosperous and sustainable future for our country.*

*Key Word: National, Bio-Economy, Policy, Route, Promote, Sustainable, growth, Development, Nigeria*

## INTRODUCTION

The National Bio-Economy Policy (NBP) seeks to develop the blue and green economy as an effective tool for enhancing the nation's economic growth and development. The experience of some emerging economies has shown that bio-economy can stimulate substantial growth in the economy through its positive impact on competitiveness, job creation and poverty reduction. This is particularly so when effectively aligned with other contemporary policies that enhance productive activities, engender macroeconomic stability, anchored on good governance, and a business-friendly environment.

The NBP therefore has a crucial role to play in propelling and addressing food security, energy, environment (waste management/climate change), health, chemical industries, pharmaceuticals, textiles, plastics, innovation & bio-entrepreneurship in ways that alleviate poverty, achieve sustainability and sustainable development of the productive sectors. The policy is developed to align with the Nigeria Medium-Term National Development Plan (MTNDP) 2021-2025, as well as the country's Agenda 2050. In this regard, NBP has been effectively aligned with the Nigeria Industrial Revolution Plan (NIRP), SDGs, investment policy and other sectoral policies, to ensure its harmony, comprehensiveness and consistency with the domestic policy environment.

The Nigeria Bio economy Policy is a comprehensive policy framework aimed at promoting the sustainable development of the bio economy sector in Nigeria. The policy is designed to guide the growth of the sector and ensure that it contributes to the country's economic development and the achievement of the Sustainable Development Goals (SDGs). The bio economy in Nigeria is a rapidly growing sector that has the potential to drive economic growth, create jobs, and improve the country's food security. The bio-economy is based on the sustainable use of biological resources, such as crops, forests, and oceans, to produce food, energy, and other products.

The Nigeria Bio-economy Policy differs from the Green Economy, Bio-economy, Bio-based economy, and Circular-Economy in several ways. The Green Economy focuses on the development of environmentally friendly economic activities, while the Bio-economy focuses on the production and use of bio-based products and services. The Bio-based economy is focused on the use of renewable biological resources, while the Circular-Economy aims to eliminate waste and promote the efficient use of resources. The Nigeria Bio-economy Policy is unique in its focus on the sustainable development of the bio-economy sector in Nigeria. It seeks to promote the sustainable use of biological resources, while also ensuring that the sector contributes to the country's economic growth and the achievement of the SDGs.

Achieving the SDGs and the transformation required by the 2030 Agenda hinges on effective national policies. National development plans play a critical role as they are at the centre of the policymaking process. To accelerate localisation of the SDGs national planning must be aligned with the SDGs through improving the policymaking process, removing systemic barriers, and engaging diverse stakeholders to innovate and sustain change.

## LITERATURE REVIEW

### The Concept of Bio Economy

Bio-economy is defined as “an economy where the basic building blocks for materials, chemicals, and energy are derived from renewable biological resources.” From: *Bio-Based Materials and Biotechnologies for Eco-Efficient Construction*, 2020. The bio-economy covers all primary production sectors that use and produce biological resources, i.e. agriculture, forestry, animals, crops, fisheries/marine culture and aquaculture; and all economic and industrial sectors that use biological resources, micro-organisms and processes to produce food, feed, bio-based products, energy and services. It cuts across these sectors, eco-systems and systems, interlinking them and creating synergies. It has a crucial role to play in propelling and addressing food security, energy, environment (waste management/climate change), health, chemical industries, pharmaceuticals, textiles, plastics, innovation & bio-entrepreneurship in ways that alleviate poverty, achieve sustainability and sustainable development of the productive sectors. It penetrates a host of SDG's sectors, especially agriculture, forestry, foods, energy, etc.

Bio-economy has made substantial contribution to the global socio-economic growth; in the UK, it injected over £200 billion gross value into British economy and supported 5 million jobs by 2014 (Bauen et al. 2016). The predominant role of waste market has been highlighted in the UK and beyond. Considerable amount of carbon-containing and nutrient-rich wastewater and organic solid waste resources are generated every year globally. As estimated by Green Investment Bank, UK waste capacity by 2020 could bring £5 billion investment opportunity. UK wastewater estimated as 16 billion litre per day, together with annual production of over 100 million tonnes of carbon-containing solid bio-waste (e.g. BFMSW) above 14 million tons of forestry and agricultural residues and large amount of other waste provide significant opportunities (BIS 2015). They could be converted via various routes to bioenergy or other value-added products shifting us to a resource-circular bio-economy.

The work on bio-economy in Europe was developed through the support of different policies that allowed to create a strategy to foster this sector. Its history is presented in the paper by Patermann and Aguilar (2018) that explains how since 1982 different research frameworks of the European Commission have supported biotechnology and natural sciences. One of the earliest research framework programs addressing these issues was the fifth framework which included key factors and one of them was the “Cell factory”. This key factor, besides advancing science issues integrating innovations into living cells (microbial, plant, and animal cells) and their products, also included environmental aspects and products and processes of interest to the society. These societal interests included health, the environment, food, agriculture, agro-industries, and high value-added products (Patermann and Aguilar 2018). The different research programs addressing these innovations were the basis for more ambitious policy initiatives which included the Strategy on Biotechnology in 2002, the concept of the Knowledge-Based Bio-Economy, and the Strategy on Bio-economy in 2012 (Patermann and Aguilar 2018).

The document from the OECD defined bio economy as “ a concept that uses renewable bio-resources, efficient bioprocesses and eco-industrial clusters to produce sustainable bio-products, jobs and income” (OECD, 2004). Later the same organization defined it more thoroughly to include all the process as “the economic activities related to the invention, development, production and use of biological products and processes” (OECD, 2010). Therefore, it also covers the activities related to it (feedstock production or origin, processes and conversion and final products). Nevertheless, as argued by Patermann and Aguilar (2018), these definitions focused mainly on the economic benefits of using biotechnology but not on social acceptance (or benefits).

Different projects were funded during the 7th framework on bio-economy such as the BIOCORE project that also presented a policy analysis of all the different regulatory instruments that shaped the concept of bio-economy (Diaz-Chavez, 2012a). The evolution to the Bio-economy Strategy in 2012 allowed to focus on new bio-based value through bio-refining concepts and including new models with public–private partnerships with the BBI or Bio-Based Industry. The BBI (2018) operates with a 3.7 billion Public–Private Partnership between the EU and the Bio-based Industries Consortium, Operating under Horizon 2020. It is based on the principle to reduce Europe’s dependency on fossil-based products, meet the EU climate change targets, and lead to a greener and more environmentally friendly growth (BBI, 2018). It currently funds over 60 projects in Europe regarding the main objectives of the BBI on bio-economy.

The status of bio-economy strategies in the world is highly dominated in countries belonging to the Organisation for Economic Co-operation and Development (OECD), particularly those belonging to the International Energy Agency (Hess et al., 2016). A review made on the original research of the IEA (Beerman et al., 2014 in Hess, 2016) explained that the approaches in most of the countries with a strategy tend to be top-down and policy-driven. The research topics mostly cover sustainable biomass supply and bioenergy production. Some of the countries in other regions covered by the study included Brazil, South Africa, and Japan (Hess et al., 2016).

A Bio-resources Innovation Network exists in East Africa (BioInnovate Africa, 2018). This program in its first phase (2010–15) focused on building platforms on crop improvement technologies, value-added products from millet and sorghum, sustainable utilization of agro industrial waste, and bioscience innovation policies. The program extends to Burundi, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda. This has a clearer social component as within the bio-economy it considers an incentive for smallholder farming communities to produce more and for agro/bioprocessing enterprises to become more competitive and environmentally sustainable. Nevertheless, many social issues are still to be considered also in OECD and EU countries to achieve a real sustainable bio-economy.

While conceptions of a bio-economy emerged in the 20th century, it was not until the 21st century that the concept started attracting great interest from scientists and politicians; shaping development strategies. (McCormick & Kautto, 2013). Today, utilization of living organisms of plants, animals and microorganisms and their integration into one large segment (complex) of real economy, which is the essence of bio-economy, has been adopted. At the initial stage, bio-economy was associated with the dynamic development and achievements

in the fields of biology and biotechnology before being linked with environment, ecological development, and sustainability but there is little consensus on what it is or what it does or does not include. (Staffas Gustavsson, & McCormick 2013)..

The way bio-economy is defined is however important due to the fact that methods and components of its definition are directly reflected in the policies, programmes, and strategies of economic development (Allen, Nanni, Schweitzer, Baldock, Watkins, Withana & Bowyer 2015). Different definitions emphasize various technological, economic and social aspects and priorities, and relate to various conditions and developmental concepts such as sustainable development and innovative development, both at national and regional levels (Hausknot, Schriegl, Lauk & Kalt, 2017).

The European Commission defined bio-economy as the sustainable production of renewable biological resources and their processing into food products, feed and industrial goods and into bioenergy, which is based on agronomy, ecology, food sciences, social sciences, biotechnology, nanotechnology, ICT and engineering and includes agriculture, forestry sectors, fishing industry, food, pulp and paper production as well as elements of the chemical, biotechnology, energy and transport sector (Sillanpaa M, & Ncibi 2017),. This definition, a result of the development of strategy in using renewable biological resources in various sectors of the economy, is comprehensive but not final because conditions are constantly changing, new products and solutions are appearing, and concepts of development are modified (Ipate N, David KG, Ipate & Bogdan 2015).

A presidential administration's definition of bio-economy in the United States shared several similarities with the EU's definition. A White House document states that bio-economy is an economy based on the use of research and innovation in biological sciences in order to power the economic activity and to generate public profits. Maciejczak (2017), states that bio-economy can be defined as an economy, in which the main production components manufacturing of materials, chemical products, and energy, are based on biological and renewable resources. Birch K. (2022) said that it is commonly understood to be a complex of issues related to the safety and security of food and energy, climate change and environment protection, as well as many social and cultural changes. It also includes the traditional sectors of the economy which produce bio-products and services by using biotechnologies

Ramcilovik-Suominen S, & Pülzl, (2016) observed that Leveraging on innovations in the life (sciences) and bio-industries, bio-economy is based on the sustainable production and conversion of renewable biomass into a range of bio-based products, chemicals, and energy to achieve ecological and social sustainable growth and employment based on the wealth of biological resources (Pfau SF, Hagens JE, Dunbar & B, Smits 2014).

### **Economic Benefits**

To address these challenges, the Nigerian government has set several targets for the bio-economy. These include increasing the country's agricultural productivity by 2% per year, increasing the share of renewable energy in the country's energy mix, and increasing the value of the bio-economy to \$1 billion by 2025. The economic benefits of the policy highlights the

potential for the bio economy sector to contribute to Nigeria's economic growth, create new jobs, and provide new sources of income for rural communities. The component also assesses the potential for the sector to promote sustainable development and reduce poverty in Nigeria.

### **Alignment with the SDGs and National Development Plan**

The policy aligns with the SDGs and the National Development Plan (2021-2025) by promoting the sustainable use of biological resources and the development of the bio economy sector in Nigeria. The policy also seeks to ensure that the sector contributes to the achievement of the SDGs and the broader national development goals. The Sustainable Development Goals (SDGs) provide a powerful aspiration for improving our world – laying out where we collectively need to go and how to get there. Responsible business and investment will be essential to achieving this transformational change. All companies can play a role in meeting the ambitious targets of the SDGs. While the scale and scope of the global goals is unprecedented, the fundamental ways that business can contribute remain unchanged.

The SDG Advocates, appointed by the UN Secretary General, have been given the task to promote the universal sustainable development agenda, to raise awareness of the integrated nature of the SDGs, and to foster the engagement of new stakeholders in the implementation of the SDGs. With the support of the UN Global Compact, a number of the SDG Advocates are calling on business to take concrete action towards helping the UN achieve the SDGs. It is clear that responsible business will play a crucial role in fulfilling the SDGs. By doing so, businesses and corporate leaders will not only help build a prosperous, more sustainable world, but also mature new global markets and enter the next era of business. We now have the opportunity to translate the SDGs into responsible business practices, innovation and investment. On 22 June 2016 a letter was sent to Fortune 500 companies to call on them to commit to responsible business and adhere to universal principles of sustainability. Companies are encouraged to take five steps to align their business with the SDGs: assess their impact against the 17 goals, engage with their board, with their shareholders, their employees and show commitment to the public. These business commitments are being gathered and will be announced during the UN General Assembly week in September in New York.

The 2030 Agenda for Sustainable Development encourages national target-setting and adaptation of the SDGs into national process, policies, and strategies. Since the adoption of the 2030 Agenda, there has been an increase in the number of national development plans (NDPs) adopted, accelerating a trend over the past two decades. The number of countries with an NDP has more than doubled between 2006 and 2018, from 62 to 134 (Chimhowu et al. 2019). NDPs have increasingly become an essential part of countries' attempts to deal with the complexity of socio-economic and environmental processes at the national and global levels, and more recently, to respond to various international agreements (e.g., the Paris Agreement) and global agendas.

An NDP stipulates the strategic direction, development priorities, and implementation strategies for a country, and is often produced through a national consensus process. It provides the institutional framework and foundation for other policy documents, such as budget plans,

investment plans, and implementation processes, and for monitoring. Integration of the SDGs at the national level has rarely gone beyond mapping and reporting (Grainger-Brown and Malekpour 2019). It remains unclear whether these plans can fully reflect the transformative potential of the SDGs. Yet they are a significant step in integrating universally accepted global goals into national development planning, Accelerating 2030 Agenda Integration, Aligning National Development Plans with the Sustainable Development Goals (Tarek Katramiz & Mahesti Okitasari 2021).

Achieving NDPs requires inclusiveness and sustainability considerations to be incorporated into macroeconomic policies and financial regulations, budgeting, trade and investments, economic diversification, and domestic resource mobilisation. NDPs that can be used for global reporting and policymaking need proper monitoring and adequate reporting; which relies upon effective national planning systems for implementing national development priorities and the SDGs. At present, horizontal accountability in such systems remains very limited and efforts are needed to enable involvement of parliaments, supreme auditing institutions, and national human rights institutions (Breuer and Leininger 2021).

### **Partner Mobilization and Subnational Implementation Approach**

The major stakeholders in the bio-economy in Nigeria include the government, private sector, and civil society. The government plays a key role in setting policy and providing enabling environment and support for the sector, while the private sector is responsible for investing in and developing the bio-economy. Civil Society Organizations are also important in raising awareness and promoting sustainable practices and monitoring for responsible and judicious utilization of investments in the sector. The policy recognizes the importance of partner mobilization and subnational implementation by seeking to mobilize partners and stakeholders from various sectors, regions and sub-nationals in promoting sustainable development of the bio-economy sector and in ensuring its growth and impact. The policy recognized existing sectoral policy frameworks of relevant MDAs and major players.

### **Gender Issues in Bio economy**

The policy recognizes the important role that women and persons with disability (PWD) play in the bio economy sector and seeks to promote gender equality, inclusiveness and the empowerment of women in the sector. The policy aims to ensure that women have equal access to opportunities and resources in the sector and that they are able to participate fully in its growth and development.

### **Financing and Budgeting Arrangement.**

The financing and budgeting model component of the policy outlines the funding and financing arrangements for the bio-economy sector in Nigeria. The model aims to ensure that sufficient resources are available to support the growth and development of the sector, and to promote public-private partnerships and investment in the sector. The Bank of Industries (BOI) shall manage the finances of the National Bio economy Policy (NBP) while providing single digit loans to all actors in the value chain where applicable

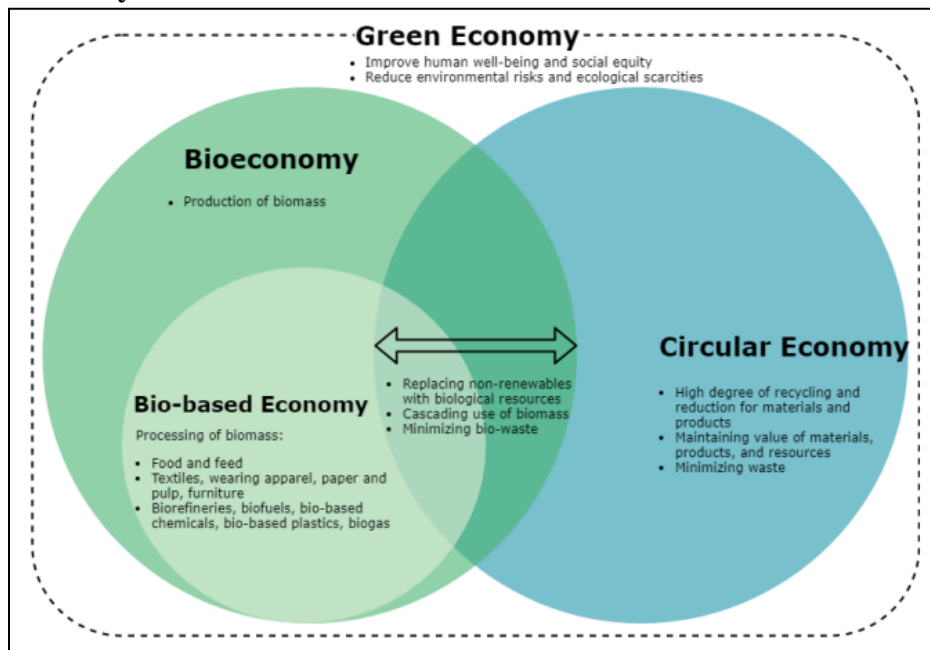
## Monitoring and Evaluation

The policy recognizes the importance of monitoring and evaluation in the growth and development of the bio-economy sector in Nigeria. The policy aims to ensure that the sector is monitored and evaluated regularly to assess its impact and determine the need for adjustments and improvements to the policy framework.

## Performance and Measuring Implementation of the Policy

Key performance indicators (KPIs) measure the level of implementation of the policy and is important while considering the effectiveness of partnerships. A major step in operationalizing the policy will be to develop well costed strategic implementation plan which will have a one-year start off annual operational plan (AOP). However, to achieve these goals, the country will need to overcome the challenges facing the sector and increase investment in research and development. With the right policies and support, the bio economy in Nigeria can become a major driver of the country's economic development.

## Relationship between Green Economy, Bio-economy, Bio-based Economy and Circular Economy



In addition to the term 'bio economy' there exist several related terms, such as 'bio-based economy', 'green economy' and 'circular economy'. The VENN diagram above shows the relation and overlap between the terms.

The green economy is generally considered as being an umbrella concept (d'Amato et al., 2017) and is understood to "result in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". In its simplest expression, a green



economy can be thought of as one which is low carbon, resource efficient and socially inclusive” (UNEP, 2011, p. 1).

The bio-economy is generally considered to be part of the green economy. Generally, the bio-economy is often more related to global economic growth and technological development (Pülzl et al., 2014). The concept of the bio-economy has early on been linked with the concepts of the bio-based and the circular economy.

**For the purpose of this Policy framework:**

Bio-economy shall mean “the knowledge-based production and utilization of biological resources, biological processes and principles to sustainably provide goods and services across all economic sectors”.

**It involves three elements:**

1. Utilization of renewable biomass and efficient bioprocesses to achieve a sustainable production;
2. Utilization of enabling and converging technologies, including biotechnology (knowledge driven Bio-economy);
3. Integration across applications such as agriculture, energy, health and industry

The bio-based economy is seen as part of the bio-economy and relates to the conversion of biological resources into products and materials. This is also referred to as bio-based production. In some definitions of the bio-based economy, an emphasis is put on innovative bio-based products such as biopolymers and bioplastics (e.g. FAO, 2016) while in others, traditional bio-based products such as bio-based textiles, wood products, pulp and paper are explicitly included as well (e.g. Carus and Dammer, 2018).

The circular economy, which shares the rise in popularity and can work complementary to the bio-economy (European Commission, 2017), can be described as an economy in which products and materials used show a high degree of recycling and reduction, contrary to a linear economic model that builds on a 'take-make-consume-throw away' pattern (Bourguignon, 2016). Substitution of non-renewables with sustainable produced biomass is also an important part of circular economy. The 2013 report by Ellen MacArthur Foundation, a strong supporter of the circular economy concept, defines it as “an industrial economy that is restorative or regenerative by intention and design” (Ellen MacArthur Foundation 2013, p. 14). Similarly, the European Commission defines the circular economy as an economy "where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimized. This is an essential contribution to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy." (European Commission, 2018b).

## Economic Environment

Nigeria is located along the coastline with the longest maritime border in West Africa measuring 853 kilometers and bordered by Republic of Benin, Cameroon, Chad and Niger Republic. With a population of over 200 million people, (with a large youth component), it consists of 36 States

Nigeria is the 32nd largest country in the world with a total area of 923,768 sq km broken down thus:

**Land:** 910,768 sq km

**Water:** 13,000 sq km

**Agricultural land:** 78% (2011 est)

Arable land: 37.3% (2011 est.) / permanent crops: 7.4% (2011

est.) / permanent

Pasture: 33.3% (2011 est.)

**Forest:** 9.5% (2011 est.)

**Other:** 12.5% (2011 est.)

with a Federal Capital Territory and 774 Local Government Areas covering over 923,000 square kilometer and is endowed with abundant resources. It is Africa's biggest oil exporter and has the largest natural gas reserves on the continent.

### Rationale for the National Bio-economy Policy

It is in the context of the environment described above that this NBP 2023 -2030 is set, as a comprehensive approach aimed at addressing these prevailing challenges and promoting a competitive Bio-economy-enabling environment that brings Nigeria back to the sustainable path of economic growth and development.

According to OECD, by 2030, Bio-economy, the use of Bio-technologies will contribute 35% of the output of chemicals and other industrial products that can be

manufactured using bio-technology, up to 80% of pharmaceuticals and diagnostic production and some 50% of agricultural output. The bio-economy has already been adopted by a significant number of low and middle income countries, with available bio-mass and well-developed primary sectors, as a new vision of development, and can be a valid path towards the achievement of the Sustainable Development Goals SDGs as well as the commitments under the Paris Climate Agreement. As with Nigeria, bio-economy could unlock new opportunities for economic development and industrialization and support economic and social objectives.

Biology and Technology are rapidly replacing ICT and Oil as the driver of the world's economic growth. But currently, the overall contribution of Bio-technology is in the area of industrial applications (39%) of the total output of Bio-technology in this sector, followed by Agriculture (36%) of the total and health applications (25%) of the total and health applications (25%) of the total. Conceptual Framework, Philosophy, Strategies and Approach.

### Vision, Mission and Objectives

**The Core Vision:** By 2030, Nigeria will be the leader in Africa in developing, manufacturing, using and exporting Bio-based solutions

**The Mission:** "Bio-economy will move Nigeria up the value chain by harnessing bio-resources and convergent technologies to build a resilient and leading competitive economy in Africa by 2035."

**Objective:** The main objective of the National Bio-economy Policy is to substantially increase the contribution of the Bio-economy sub-sector to the nation's GDP to accelerate economic

growth and national development. The overall objective is to create a comprehensive roadmap for harnessing Nigeria's bio-resources for the concentric diversification, growth and development of the Nigerian economy. Within this overall objective, and in the light of the Guiding Principles, specific objectives include the following:

### **Specific Objectives and Key Targets**

**Agriculture, Food and Nutrition Security & Nutrition:** By 2030, Bio-economy will enhance food security by increasing the growth of agriculture GDP from 3.58% to 6%, ahead of the population and urbanization growth rate;

**Economic Growth & Industrial Competitiveness:** By 2030: Bio-economy will strengthen the transition from mono-cultural fossil energy based economic planning and development to more efficient and sustainable non-fossil, bio-based materials dependent economic planning and development; The GDP contribution of the Bio-economy will grow to 20% of the National GDP; Bio-economy will contribute 20% of Nigeria's foreign exchange; Bio-economy products imports (such as Active Pharmaceutical Ingredients-API, improved Seeds, fish products, industrial inputs etc.) will be reduced by 50% as a result of the policy; and Bio-energy (Bio-ethanol and Bio-diesel) contribution will exceed 10% of our PMS consumption (E10 and D-20 self-sufficiency). **Environment Protection, Bio-Diversity & Climate Change:** Bio-economy will contribute substantially to reducing carbon emission and transition to low carbon economy in line with Nationally Determined Contribution (NDC); and significantly contribute in mitigating the effects of climate change.

**Social Inclusion & Sustainability (Health, Education, Employment, Poverty Reduction & SDG):** by 2030, at least One million Nigerian Youth will be skilled in STEM Skills, Bio-entrepreneurship and Innovation technologies, as well as 10 million new jobs created, leading to the achievement of most of the SDGs; (SDG 1,2,3,4,7,8,10,11,13,14,15 & 17) and **Macro-Economic Planning & Co-ordination:** by 2030, Bio-economy will strengthen innovation, research & development, bio-entrepreneurship and competitiveness through policy alignment, co-ordination, local and strategic partnerships, Triple-Helix knowledge and innovative technology transfer partnerships at all levels of government with Academia, R&D, Private Sector (and Civil Societies-Quadruple – Helix Partnership)

### **Guiding Principles**

This NBP is founded on the following broad principles:

- i. Food security takes priority over the production of raw materials for industry and energy;
- ii. Pathways to higher value-adding potential must be given priority;
- iii. Strengthening the competitiveness of the bio economy in the areas of high growth potential and employment intensity should be prioritised;
- iv. Bio economy requires well-trained workforce and well-informed specialist personnel;
- v. Bio-technology acquisition, knowledge transfer and adaptation to underpin strategic international partnerships;

- vi. The bio-economy and the production of goods need due regard to the protection of the environment, the climate, nature and bio-diversity, quality infrastructure and also to compliance with product quality and standards of social responsibility; and
- vii. In developing the bio-economy there is a need for close cooperation and engagement between relevant stakeholders, from the political, economic, scientific, and environmental spheres and from society at large.

### **Development Process of the National Bio-economy Policy**

The process of developing the National Bio-economy Policy was participatory and inclusive while taking into consideration the need to involve all relevant stakeholders to ensure the policy addresses the unique needs of the Nigerian bio-economy.

#### **Key steps include the following:**

**Forming a National Bio-economy Policy Development Team:** This team composed of experts and stakeholders from relevant government agencies, industry, academia, and civil society, and would be responsible for leading the policy development process.

**Conducting a comprehensive situation analysis (SITAN) using (SWOT/PESTEL) of bio-economy in Nigeria:** This step involved identifying key stakeholders, assessing existing resources and infrastructure, and identifying areas for potential growth in the bio-economy.

**Stakeholder engagement and consultation:** This was done by engaging with key stakeholders such as government, industry, academia, and civil society to gather their input and feedback on the development of the bio-economy policy using a structured data mining tool (Questionnaire).

**Development of a National Bio-economy Policy:** This step involved developing a clear and detailed strategy for the bio-economy, including goals, targets, and strategies for achieving them. This took into account the unique characteristics and needs of the Nigerian bio-economy, as well as global best practices.

**Policy formulation and drafting:** This step involve the drafting of the actual policy document and the formulation of specific policy measures using the data gathered from the questionnaire and findings from a comprehensive desk review and SITAN. This was done in two workshops involving all key stakeholders.

**Policy review and approval:** The policy document was then reviewed and approved by the Honorable Minister of State Budget and National Planning before it was officially adopted after thorough review before it is officially adopted.

**Implementation and monitoring:** The policy was then disseminated at national and subnational levels be implemented, and progress would be monitored and evaluated using quantitative and qualitative metrics to assess progress and identify areas for improvement.

## Development of Bio economy and Economic Growth

### Bio-economy contribution to Sustainable Development Goals SDGs

- The bio-economy has already been adopted by a significant number of low- and middle-income countries as a new vision of development, and can be a valid path towards the achievement of the Sustainable Development Goals (SDGs) and the commitments under the Paris Climate Agreement.
- If a bio-economy strategy aims to contribute to sustainable development in terms of environmental and social objectives, these aspects need to be clearly included in the strategy and should be measurable.
- Most countries measure the bio economy contributions in terms of value added and employment, and in most cases, social and environmental criteria are addressed only to a limited extent.



### National Challenges to Bio economy

1. Bio-economy has multi - sectoral components led by several MDAs:

Agriculture (Food security & Nutrition, Aquaculture, Blue economy,

Energy (Bio-Energy Mapping and National Strategy);

Power (Off-grid, On-grid, Energy Access);

Environment (Green Growth Strategy, Environment & Climate Change, Biosafety);

Science & Technology (Bio-technology, Research & Development);

Innovation and Bio-entrepreneurship etc.

Trade, Investment & Industry (Investment Climate Reform; Investment Promotion and Financing).

SDG Office (Sustainable Development Goals); whose activities are not fully coordinated, not least the alignment and harmonization of the support of the Development Partners and Non-State Actors.

Visionary leadership is needed, inadequate infrastructure, Lack of stable legislation,

Lack of education and training, significant investment in R&D lacking, Skills gap resulting in long learning curve, Poor infrastructures, Bio refinery required huge capital investment, No integrated multi-trophic Aquaculture (IMTA) system, early-stage commercialization, Consumer

acceptance, Fragmentations of farms and biomass supply, Lack of agri-food policy, Resistance to change, Limited reliability and completeness of existing national statistics, High level product counterfeiting and imitations.

### **Benefits of Bio-economy to National Development**

The Bio-economy Strategy provides an economic engine for the new economy that will, in turn, provide a basis for future growth. These science-based “bio-solutions” can, be used to:

Manufacture high-value protein products such as biopharmaceuticals and vaccines; Produce biofuels; Improve and adapt crops; Remedy industrial and municipal waste; Reduce production costs; Reduce environmental impacts; improve the quality of products; (chemical, pharmaceuticals, textiles, plastics etc).

Improve the performance of a range of economic sectors. Create more jobs; Enhance food security; and create a greener economy as the country shifts towards a low-carbon economy.

### **Expected Outcomes.**

Expected outcomes include, production, review and realignment of:

Strategic Framework for Bio-economy and Inclusive Green Growth, National Bio-energy Mapping, Assessment and Strategy, National Bio-Technology Development Strategy, National Green Growth Strategy, Innovation and Bio-Entrepreneurship Strategy, Bio-economy, Food Security & Nutrition Strategy, Bio-economy and Health improvement Strategy (Bio-medical & Bio-pharmaceutical Strategy), National Implementation Action Plan, Bio-based solution products and services, Identification of funding of Pilot projects (low hanging fruits) and support to “off-grid” and renewable energy projects/low carbon micro-enterprises, Enabling Business Environment, and engagement of Sub-national entities, Investment & Financing Strategy and Plan, ECOWAS, Regional and continental networking plan to share information and cascade regulatory best practices., Capacity Building – Institutional, technical and organizational capacity building, Increased employment and investment readiness, Increased economic growth, recovery, productivity and competitiveness., Substantial improvement in Sustainable Development Goals relating to Food Security & Nutrition, Extreme Poverty, Health, Energy, Jobs, Environment & Climate Change, Improved macro-economic governance, resource allocation and Donor co-ordination, Greater on-going dialogue between all levels of Governments, non-state actors, private sector and citizens.

### **Situation Analysis**

#### **Preamble**

Nigeria's bio economy is largely based on its vast agricultural sector, which employs a significant portion of the population and contributes to the country's GDP. However, the sector has faced challenges such as low productivity due to biotic and abiotic factors, lack of access to modern technologies, and limited infrastructure. Additionally, Nigeria has a large potential for development in the bioenergy sector, particularly in the production of biofuels from crops such as sugarcane and cassava. However, the development of this sector can be hindered by a lack of government support and investment. Overall, Nigeria's bio economy has a lot of potential for

growth and development, but it faces several challenges that need to be addressed in order to fully realize that potential. To understand some of these concerns, a SWOT and PESTLE analysis as shown below, shows the current situation.

### SWOT ANALYSIS

STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
1.Natural resource endowment - Agro-ecology 2.Entrepreneurship 3. Democracy and Political Stability 4.Huge Internal Market 5.Manufacturing Capacity 6.Availability of Policies and Regulatory Framework 7.Availability of Skilled Man-Power 8.Training and Research Institutions	1.Insecurity and insurgency 2.Increasing rate of Inflation 3.Poor Implementation of Policies 4.Lack of Political Will 5.Inadequate Technological Skill 6. Poorly Funded RandD 7. Poor power Infrastructure 8. Access to Foreign exchange 9. Multiple Taxation Research Development Declining investment(FDI/FPI/ Domestic Investment) Declining Oil revenue Weak institutions. Poor Govt Revenue to GDP. Heavy Debt Burden. High Inflation, Weak Exchange rate. Poor investment in human capital development – Education, Health, Employment and Poverty reduction. Territorial behaviour of MDAs	1.Trade War 2. Global Conflict 3. Diversification Agenda 4. AGOA, AfCFTA and ECOWAS ETLs. 5, Donor Funds and Partnership 6, Innovation Funds Good diplomatic Relation 7, Attraction of FDI 8, Global technological transfer	1, Brain drains 2, Bio-Insecurity 3, Climate Change 4, Epidemic and Pandemic High unemployment, Pervasive insecurity, Population explosion Extreme Poverty Prevalence. 133 million experiencing Multi-dimensional poverty and 20 million out-of-school children.

### PESTEL ANALYSIS:

- Political: The government of Nigeria plays a significant role in the development of the bio economy, and political stability and support are crucial for its growth.

- **Economic:** The bio economy could potentially contribute to the economic development of Nigeria by creating jobs and increasing exports. However, Nigeria's current economic instability could affect the development of the bio economy.
- **Social:** There is a lack of awareness and education about the bio economy in Nigeria, which could be an obstacle for its development.
- **Technological:** Nigeria lacks the technology and infrastructure needed to fully develop a bio economy.
- **Environmental:** Climate change and environmental degradation could negatively impact the resources needed to develop a bio economy in Nigeria.
- **Legal:** There is a lack of a strong regulatory framework to support the growth of the bio economy in Nigeria.

It's worth noting that this analysis is general, and the specifics of each project and location would affect the results of the analysis. Some other specific cross-cutting issues are presented in the table below

PESTLE ANALYSIS		
POLITICAL	ECONOMIC	SOCIAL
<ul style="list-style-type: none"> <li>• Government policies on issues such as tax, employment, environmental regulations, trade restrictions and reform, tariffs and political stability are important factors.</li> <li>• Policies, regulations guiding ICT application, deployment and management not backed by acts of parliament and so susceptible to political hoodwink.</li> <li>• Lack of policies based on community-generated data and private sector engagement.</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of economic policies is incoherent (not gradual or phased and does not reflect the prevailing needs)</li> <li>• The following economy factors will play a key role in DEBSTI: economic growth/decline, technology costs, exchange rates, inflation rates, specific market factors, wages rate, interest rates, taxation customer/end-user drivers, market routes and distribution, unemployment (local and national) credit availability, cost of living etc.</li> </ul>	<ul style="list-style-type: none"> <li>• The poverty, illiteracy level and availability of skilled manpower (employment) are critical factors</li> <li>• Rural-urban migration is getting worse, and placing pressure on production capabilities in rural areas. It is also contributing to a food crisis in urban areas</li> <li>• Higher STEM education research and training/ skills development</li> </ul>
TECHNOLOGY	LEGAL	ENVIRONMENTAL
<ul style="list-style-type: none"> <li>• Nigeria is a leader in fintech/ e-commerce in Africa and boasts the highest number of internet users.</li> <li>• Lack of opportunities for startups in government contracting</li> <li>• Increased know-how among young entrepreneurs</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory framework in Nigeria is strict for foreign investment to operate in the country, as such most of the high-flying technology companies are registered in Delaware or Mauritius.</li> <li>• A lot of policies and strategy documents exists but the implementation is limited.</li> <li>• Legal framework for protecting indigenous firms in any part of the country is needed.</li> </ul>	<ul style="list-style-type: none"> <li>• Erratic power supply to meet the demands of its growing population. A mixture of expanding grid access and renewable energy projects are expected to increase over the next 10-15 years.</li> <li>• Lack of designated strategic locations as innovation hubs, Incubation centres and bio-tech facilities centres in each of the geo-political zones to encourage creativity and innovation.</li> </ul>



## **Situation Analysis**

The situation analysis assessed the current state of the bio-economy sector in Nigeria using SWOT and PESTLE Analysis, including its potential for growth and the challenges faced by the sector. This component also highlights the need for a comprehensive policy framework to guide the growth of the sector and promote its sustainable development. One of the major challenges facing the bio-economy in Nigeria is a lack of investment in research and development. This has led to a shortage of skilled professionals and a lack of innovation in the sector. Additionally, the country's agricultural sector is often hampered by poor infrastructure and a lack of access to markets.

## **METHODOLOGY**

This paper is primarily descriptive in its nature. This is because it attempts to draw lessons from how the bio-economy is being envisioned and applied at different levels of governance around the world. The approach of this paper is to systematically review academic papers, and publicly accessible documents from governments and their agencies supplemented by inclusion of opinion papers of civil society organizations about the bio-economy. Following Pfau et al. (2022) and Fink (2020), there was selection of key search terms, followed by application of screening criteria to identify relevant literature, followed by the review itself and finally, collation of findings. The conclusions drawn are presented in concise manner.

## **RECOMMENDATIONS**

The concept of bio-economy has gained scientific and political attention during the recent years, with a number of countries, regions and industries creating strategies or declaring their intentions for the development of a bio-economy. Based on these observed trends, the following recommendations are provided for national stakeholders, such as policymakers and planning practitioners. Each is of equal importance.

Harness the SDGs as an opportunity to promote national goal-setting processes and influence domestic policymaking. Use the SDGs as a platform to mainstream sustainable development principles in national policymaking. Strengthen national development planning by promoting approaches relevant to the SDGs. Position human, social, environmental, economic, and institutional objectives at the same level. Ensure inclusive participation and effective stakeholder engagement in implementing the 2030 Agenda and national development plans. Harness the opportunities that the SDGs provide in terms of promoting national goal-setting processes and influencing domestic policymaking. Current approaches to national development planning are characterised by the setting of medium to long-term strategy and national priorities.

## **CONCLUSION**

The next wave of economy is bio economy, which produces economic growth and wellbeing. Already many developed and developing countries are placing emphasis on the development of a bio-economy. Nigeria and other African countries must not be left behind. To

advance a sustainable bio-economy in Nigeria, this paper calls for the development of a holistic bio-economy policy which must be an integral part of the national developmental agenda. A responsible bio-economy sector for Nigeria calls for effective governance and coordination to make it cut across all the relevant economic sectors. Enhancing a competitive and productive bio-economy requires target investment in research, innovation and skills; education and training; policy interaction and stakeholders engagement; market development support to enhance competitiveness; and demand side instruments while taking into account legitimate societal concerns and needs. With appropriate political commitment across all arms of the federation, Nigeria could embrace bio-economy to overcome a number of her environmental, social and economic challenges.

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