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Digital Economy, Bioeconomy, Science, Technology and Innovation

- RELEVANCE TO NIGERIA'S LONG-TERM PLAN

December 2020

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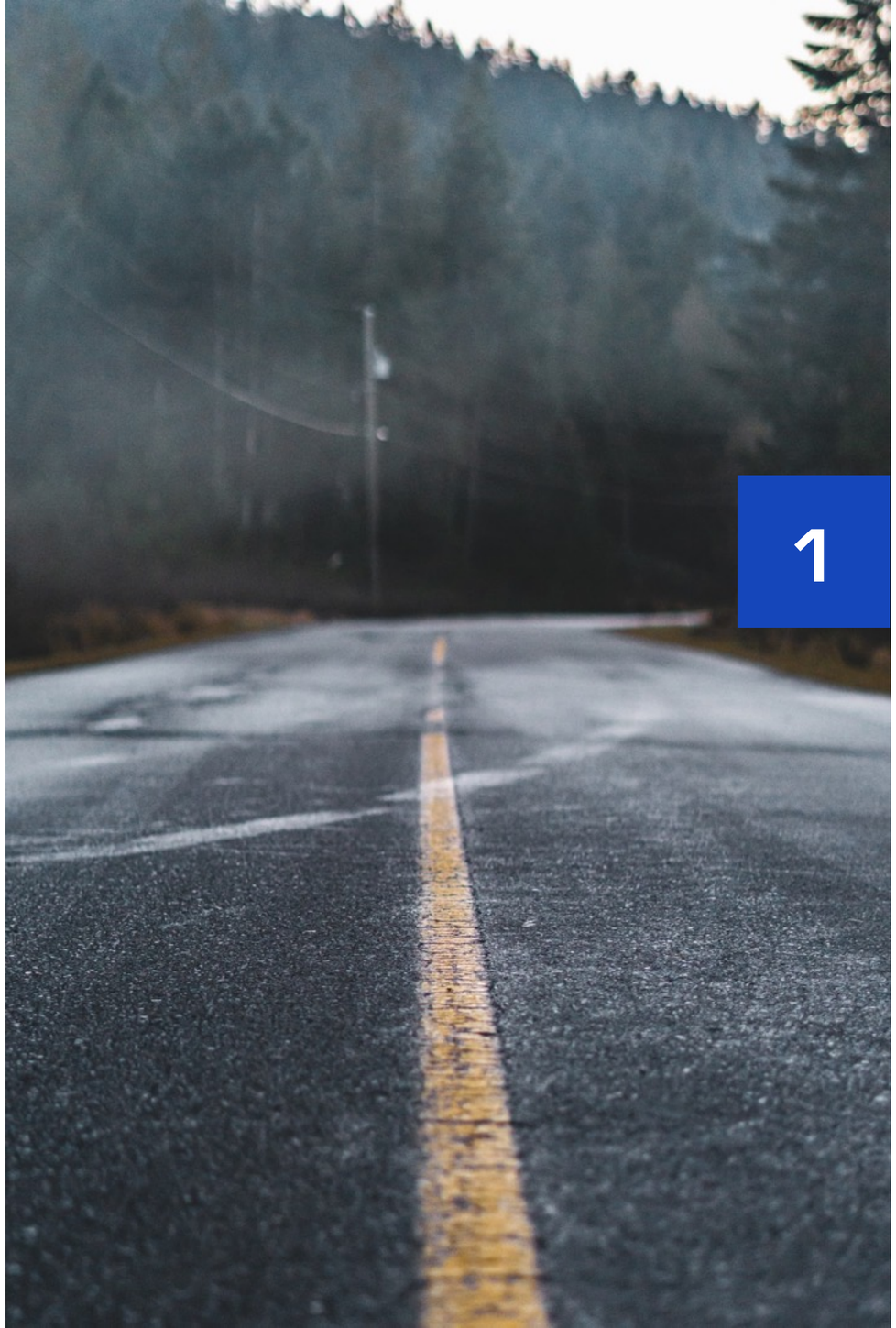
Outline



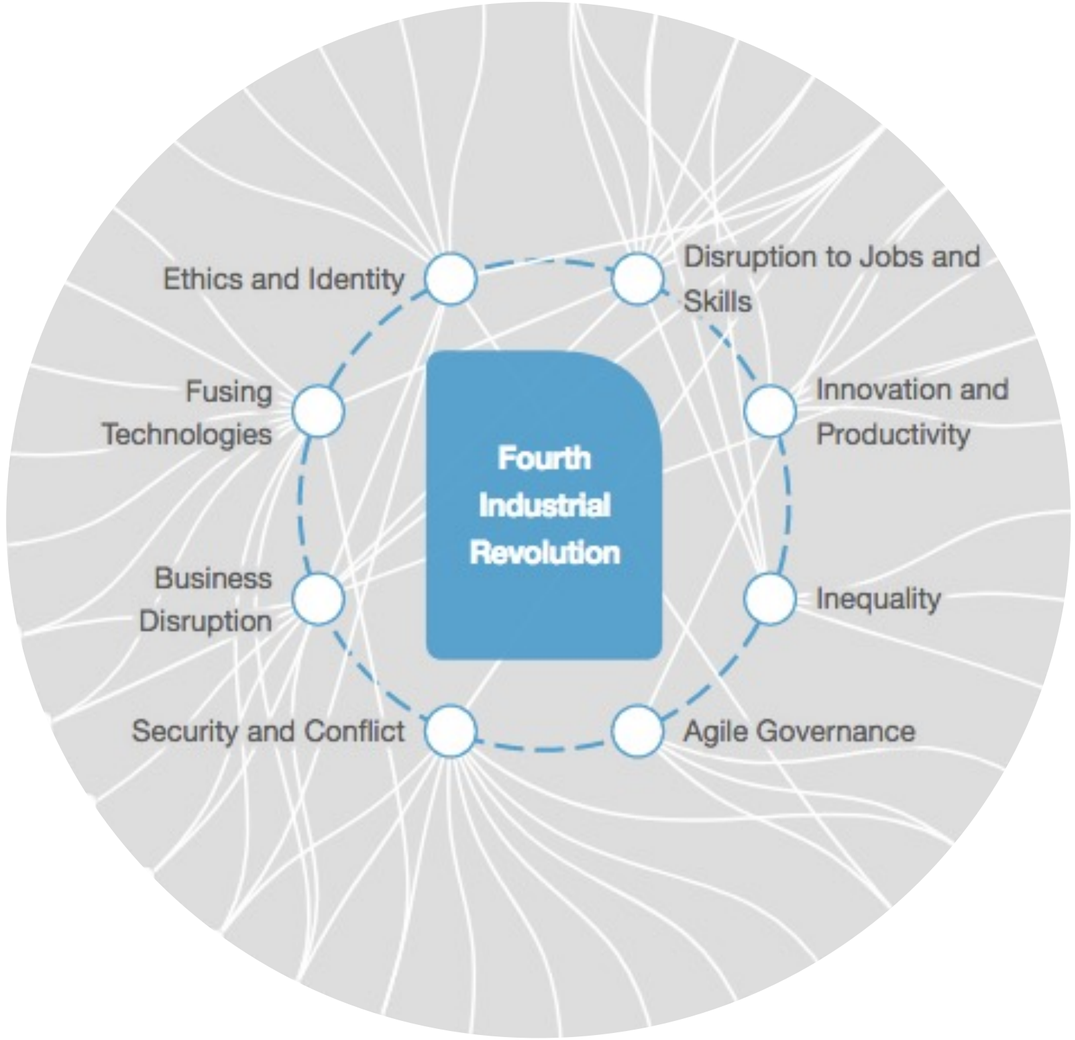
1

Introduction and Context Setting for the New Economy

Introduction – Welcome to the New.

Advancements in technology and the Fourth Industrial Revolution (4IR) is transforming businesses, industries and countries. These innovations are leapfrogging nations across physical, digital and biological domains. Technologies such as the internet of things (IoT), cloud computing, artificial intelligence, blockchain technology will continually create new opportunities, new jobs, and new industries.

COVID-19 has further accelerated the growth and adoption of new technology innovation and disruption



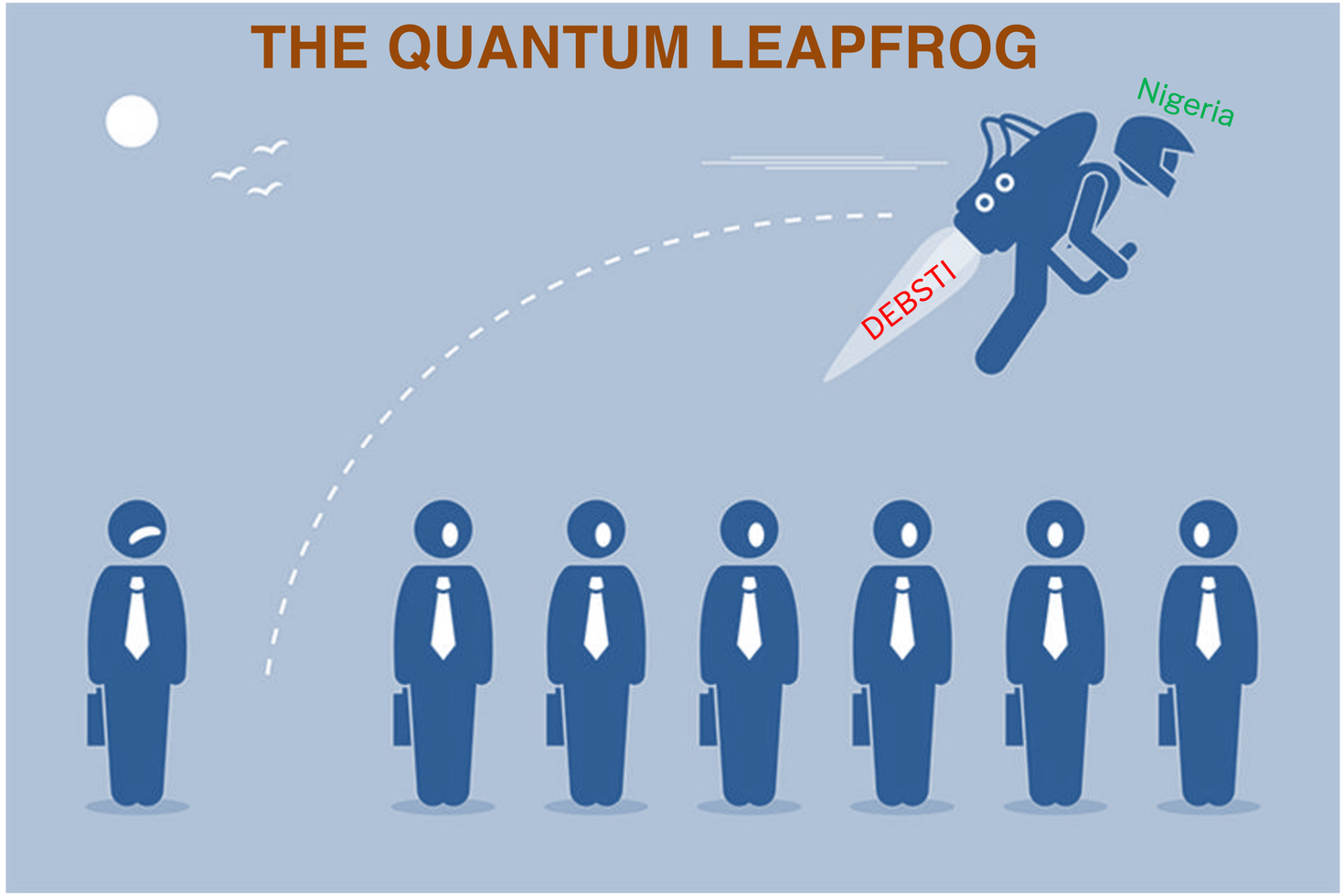
Introduction – Welcome to the New.

We are faced with a paradox where we want to create 100 million jobs in the future while advancing technology which is bound to eliminate jobs?

- Some of these technologies will eliminate jobs and disrupt traditional industries.
- Digital innovations like artificial intelligence, internet of things, quantum computing usher a new world of possibilities
- Biological innovations including genetic engineering, gene sequencing, and bioinformatics will create new possibilities for scientific advancement.
- The broad impact of DEBSTI is so pervasive, that dimensioning the key segments and mapping the economic impact is a complex exercise.
- Nevertheless, the implication on national competitiveness will be elaborate, and could swing in the positive or negative direction, depending on how Nigeria acts.

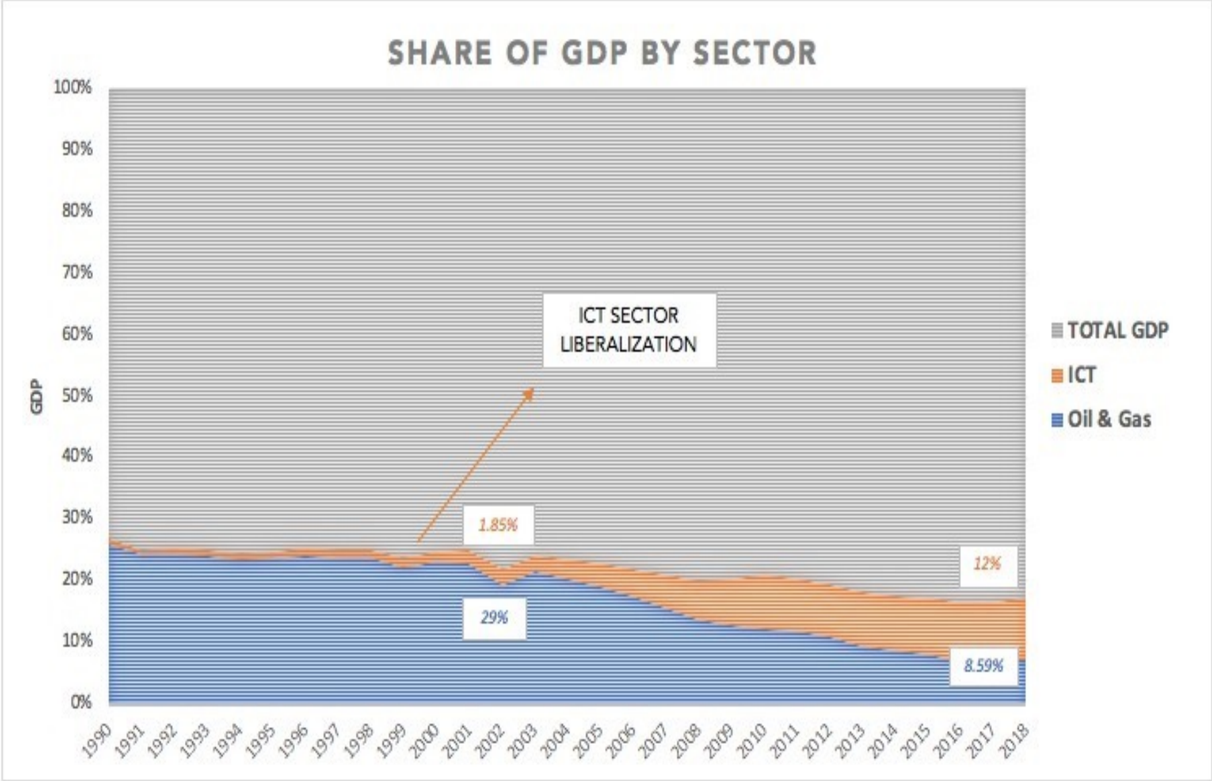
Introduction – Welcome to the New.

DESBTI is the most important TWG that other TWGs rely on to serve as the fulcrum for change. There are far-reaching impact on the outcomes of the DEBSTI vision on other seemingly unconnected industries speaking to the broad and far-reaching impact of Technology

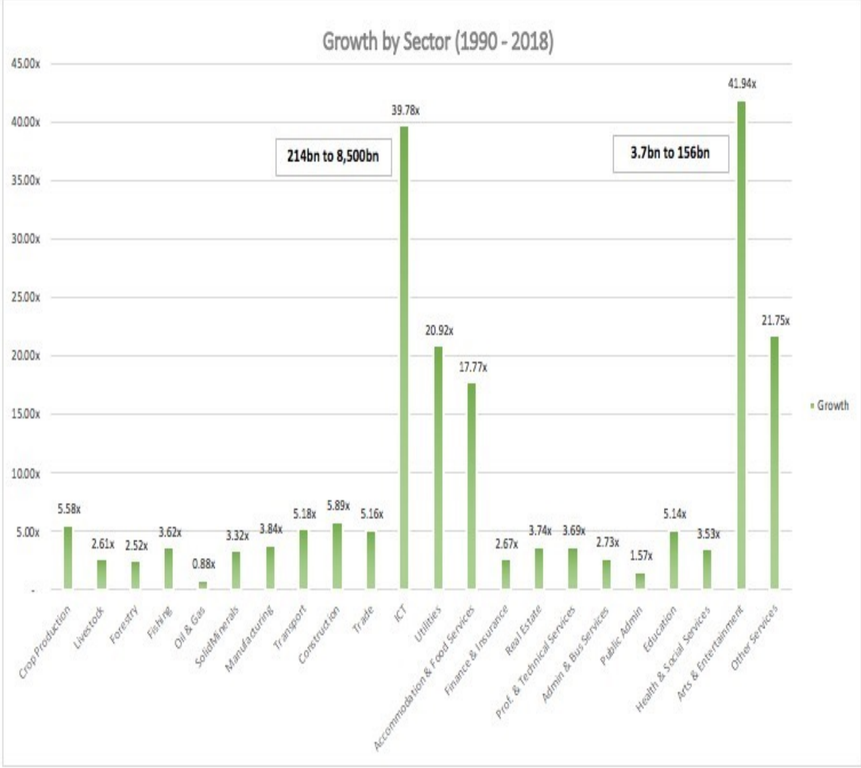


Introduction – Welcome to the New.

Given the strong evidence and potential for quantum impact, we now refer to the DEBSTI sectors as the “New Economy” given its relevance and crosscutting impact across all the other sectors in this new age. Nigeria needs to measure up to its comparator Nations in creating the right environment and framework to harness these huge opportunities in the “New Economy”.

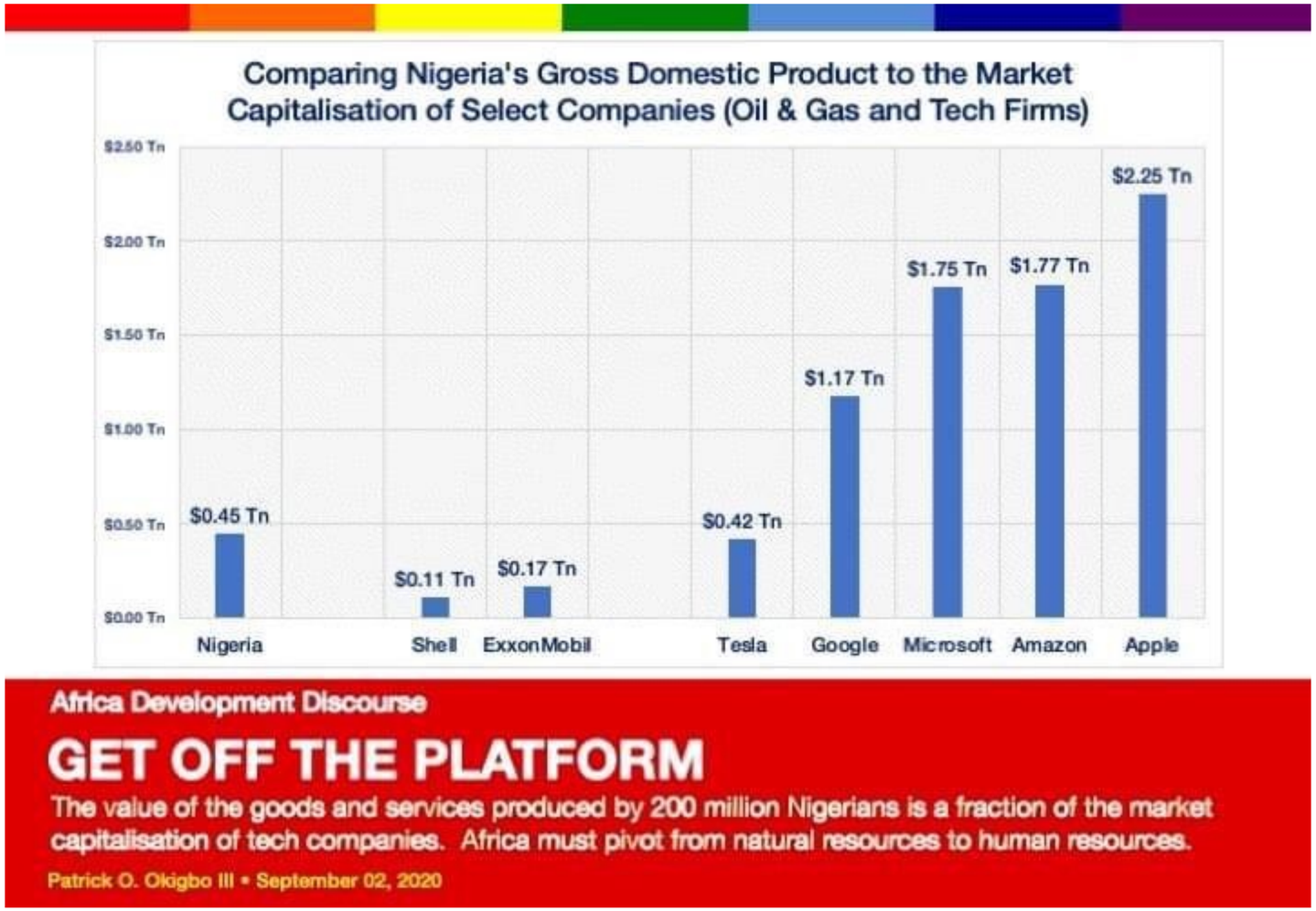


ICT’s share of GDP has been consistently on the rise.



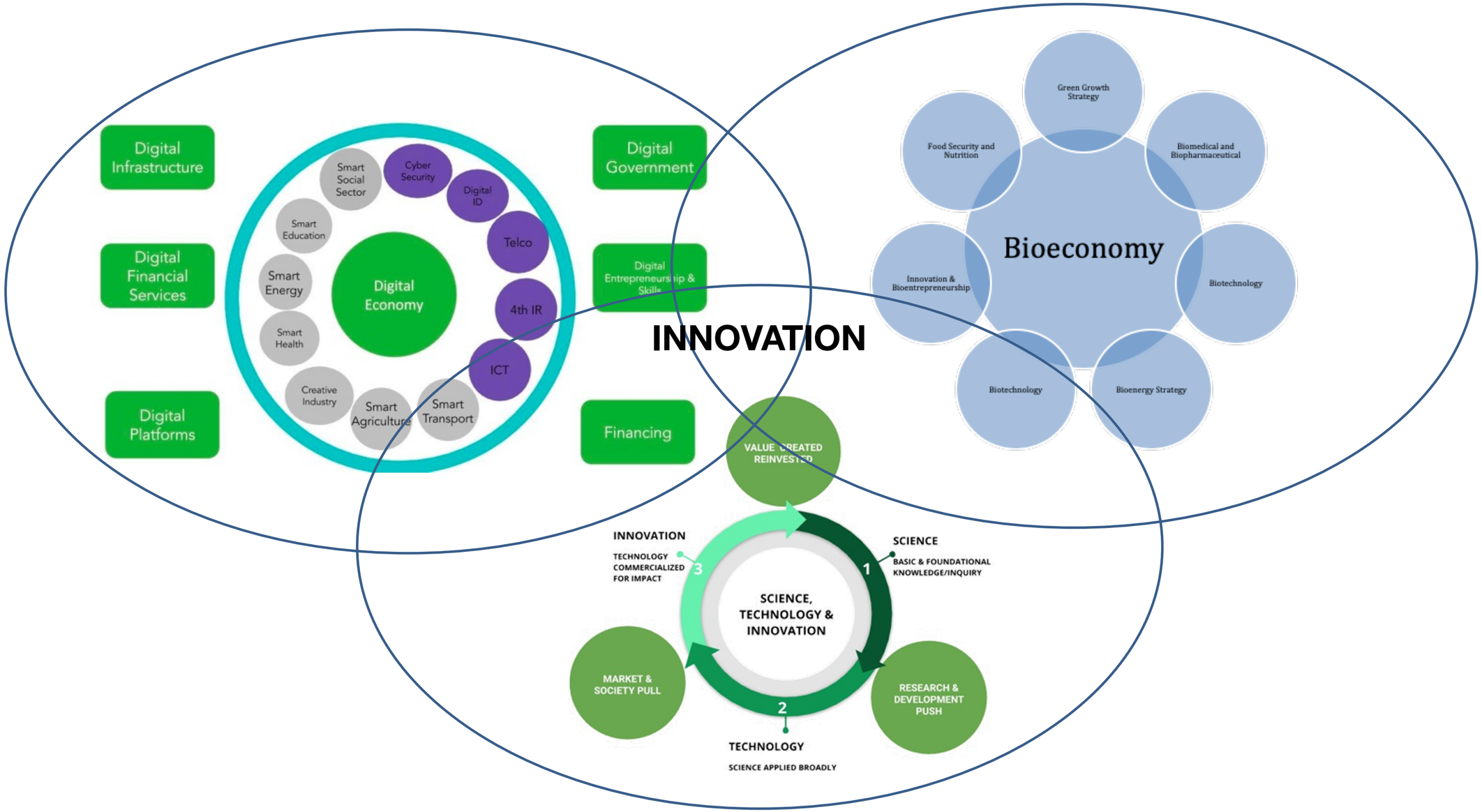
Growth of ICT Sector over the last 20 years

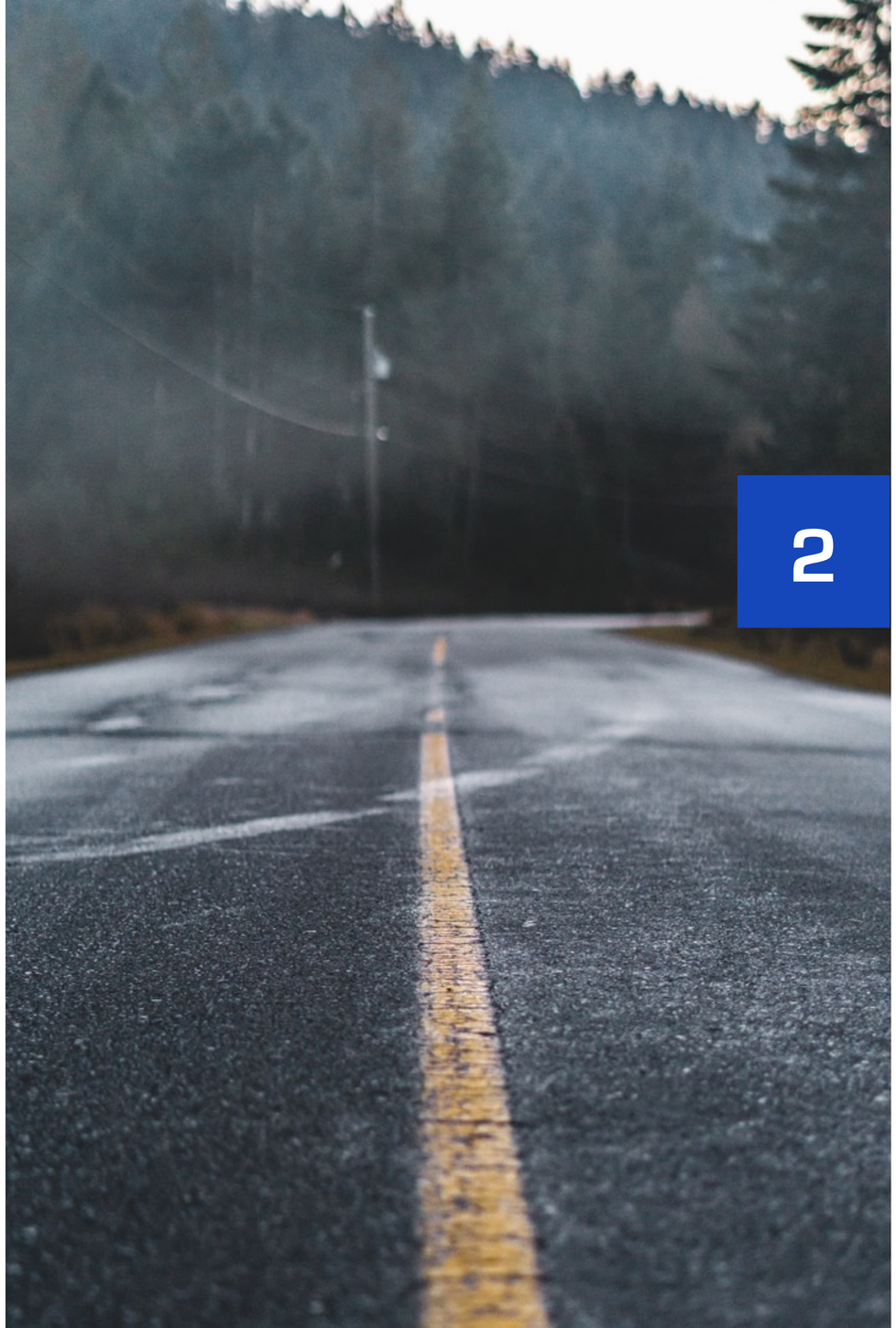
Technology is a catalytic Gamechanger with lightning bolt effects



Technology has overtaken Oil and Gas in terms of value and market size. We have seen technology companies with valuations more than double Nigeria's GDP.

Growth hacking Innovation - DEBSTI





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Current State and Gaps within the DEBSTI sectors

Current State of the DEBSTI Sectors

In diagnosing the sectors within the New Economy, we followed a laser focus approach that allowed us settle on three key buckets in diagnosis the true state and performance of these sectors within Nigeria

Global Trends

We checked and observed latest trends influencing and affecting sectors within the New Economy globally. Across Governments, we have seen the DEBSTI sectors play major roles in shaping Government policy and plans. Digital Economy's contribution to global GDP has been on an astronomical rise showing a correlation between the New Economy sectors and economic growth.

Local Trends

We have seen the DEBSTI with huge impact on Nigeria's macroeconomic outlook. We have seen successful examples across ICT where Telecommunications' contribution has grown to 14% now. For context, Oil & Gas contributes just 8.93% while Trade comes in at 13.4%. The Banking sector has also experienced exponential growth as it continually relies on technology to sustain and scale its growth.

Comparable Countries and Economies

We looked at **South Korea, Finland, China, Brazil, Singapore and Indonesia** and measured our performance across the New Economy sectors. Most of the Countries assessed had fully established plans and ongoing initiatives around the DEBSTI sectors and were already reaping significant economic benefits as a result.

SWOT Summary of the DEBSTI Sectors

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STRENGTHS

- **Large Market:** Nigeria's population of approximately 200million people makes it a destination of choice for ICT services and products.
- **ICT Infrastructure:** The installation of under –sea cables boosted bandwidth capacity in the last decade.
- **Strong academic talent base** in STEM disciplines High Rate of Technology Adoption: A youthful population that readily adopts new technologies as evident in the mobile penetration which stands at over 80%.
- **Investment and Ecosystem:** Nigeria has the top 3 digital startup ecosystem in Africa. Nigeria is a top destination for venture capital and private equity in Africa.
- **MSME in Africa:** Nigeria accounts for 44million of the 90million MSMEs in Africa

WEAKNESSES

- **Low Purchasing Power:** Inability of a large section of the population to afford new technologies especially cost associated with connectivity and bandwidth, hardware etc. The World Bank figures show that 43% of Nigerians live below the poverty line at US$1.90 a day.
- **Ease of Doing Business:** Low ranking of ease of doing business. Nigeria is ranked 131 among 190 economies, albeit an improvement from 146 in 2018, globally in the World Bank's ease of doing business index.
- **Rule of Law:** Inconsistencies in implementing and enforcing policies with respect to National ICT strategy, Intellectual Property Laws, corporate laws, enforcement of contracts etc.
- **Policy Implementation:** Commitment to implementation of various ICT strategies in Nigeria: (a) eGovernment Master Plan; (b) Digital Economy Strategy; (c) Broadband Policy; (d) USPF impact on rural coverage

OPPORTUNITIES

- **Creation of a Gig Economy:** Solution to the unemployment rate through the gig economy.
- **Last Mile and Digital Inclusion:** Limited coverage in rural areas offers a long-term opportunity to improve digital inclusion and expand undersea cables into the cities and communities; and other last mile connectivity systems
- **Growing Demand:** There is a growing demand for ICT solutions as more Nigerians gain access to smartphones and mobile lines
- **Foreign Investment:** Increasing interest of foreign companies in the startup ecosystem
- **Growing Fintech Sector:** Increasing opportunities in the high growth of the fintech industry
- **Mass Solar** deployment to boost rural ICT connectivity

THREATS

- **Policy Sustainability and Implementation Risk:** Though expected to be dissipated under the current leadership, Nigeria still has a reputation for lack of policy continuity
- **Infrastructure:** Intermittent access to power threatens the development of the ICT sectors particularly to the telecom and IT services; last mile connectivity
- **Financing and Funding:** Lack of local funding for promising startups (over reliance on foreign funders who many not necessary fund startups based on local needs)
- **Research & Development:** Lack of Commitment to funding Research and Development; and institutional capacity

PESTLE Summary of the DEBSTI Sectors

POLITICAL	ECONOMIC	SOCIAL
• Government policies on issues such as tax, employment, environmental regulations, trade restrictions and reform, tariffs and political stability are important factors. • Policies, regulations guiding ICT application, deployment and management not backed by acts of parliament and so susceptible to political hoodwink. • Lack of policies based on community-generated data and private sector engagement.	• Implementation of economic policies is incoherent (not gradual or phased and does not reflect the prevailing needs) • 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.	• The poverty, illiteracy level and availability of skilled manpower (employment) are critical factors • 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 • Higher STEM education research and training/ skills development
TECHNOLOGY	**LEGAL**	**ENVIRONMENTAL**
• Nigeria is a leader in fintech/ e-commerce in Africa and boasts the highest number of internet users. • Lack of opportunities for startups in government contracting • Increased know-how among young entrepreneurs	• 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. • A lot of policies and strategy documents exists but the implementation is limited. • Legal framework for protecting indigenous firms in any part of the country is needed.	• 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. • 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.

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A review of the current policies and strategic approach on the DEBSTI sectors undertaken by Government show massive gaps between the ideal state and the current state.

Outdated Policies

Lack of Private Sector Participation

Intellectual Property protection

Digital Divide and Financial Exclusion

Rule of Law

No Funding Framework

Lack of Proper M&E Framework

To close out identified Gaps, the approach must be broad

Triple Helix

Universities need to be strengthened to enable seamless transfer of technology and innovation from research to commercialization,

Partnerships

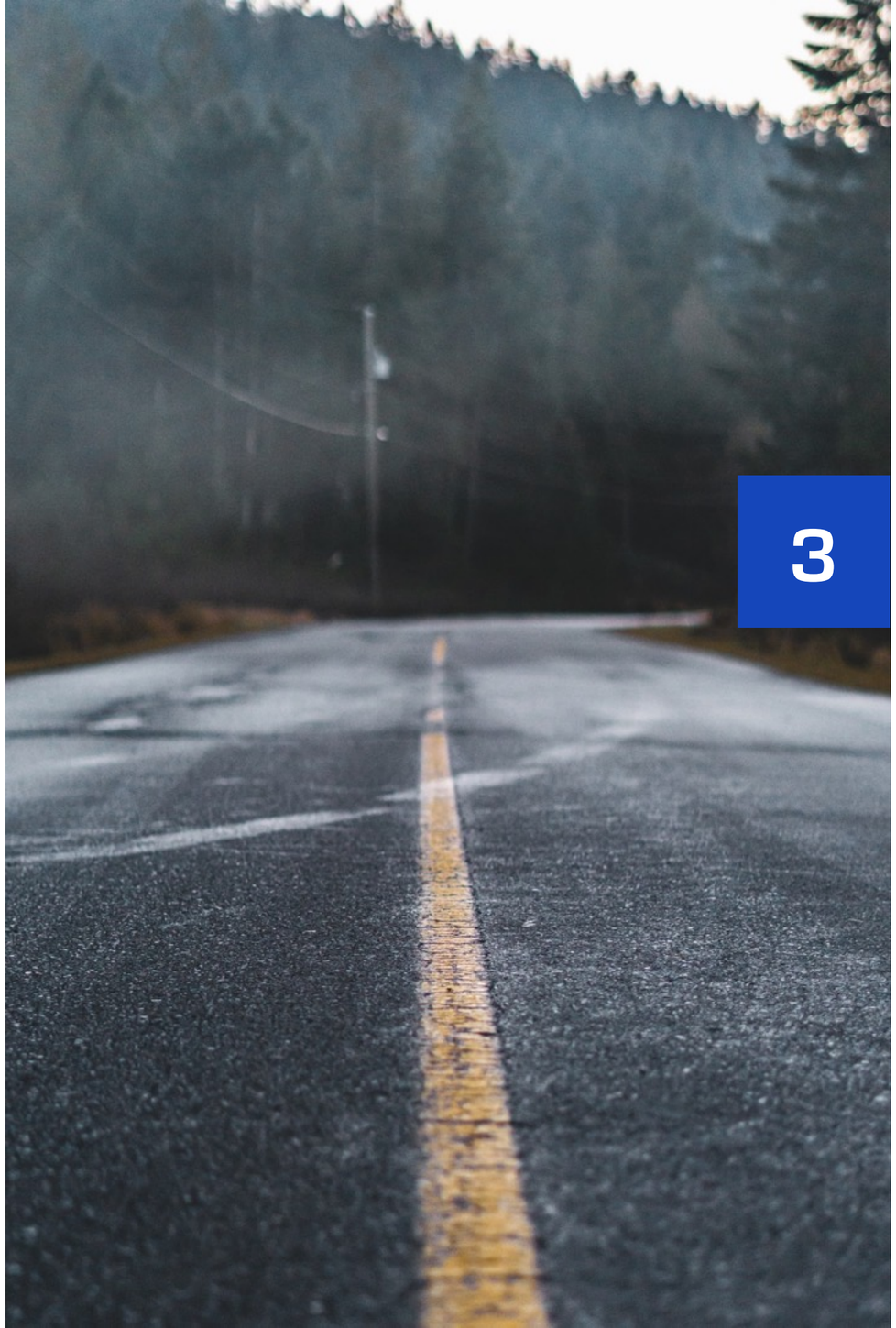
Partnerships and collaborations are key to achieving depth and diversity in the quality of output. Resources need to be harmonized across public and private sector

Funding

There needs to be a conscious drive towards sponsoring growth initiatives from pubic and private sector players. A proper funding framework must be designed to encourage capital flow

Coordination

There needs to be proper coordination and M&E processes in place to ensure initiatives meet their intended objectives and achieve impact. Proper coordination mechanisms need to be put in place at National and Sub-National levels



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Roadmap to Middle Income Country – Mapping the Paths

The New Climate Economy

Green Economy: seeks to reduce environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment.

In application, reduction of environmental risks and ecological scarcities is underpinned by scaling use of renewable energy to mitigate environmental impacts and footprints, while also scaling climate adaption projects.

Blue Economy: Ocean Economy is a GDP driver via marine resources and sea bed ecosystems.

- Fisheries, aquaculture and ecosystems conservation. Shipping, transportation and trade
- Sustainable energy, extractive minerals, gas, innovative industries
- Environmental sustainability, climate change and coastal infrastructure
- Governance, Institutions and social actions.

Circular Economy: aims to eliminate waste, and continuous reuse of resources. It is a systemic approach to economic development designed to benefit businesses, society, and the environment.

In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources.

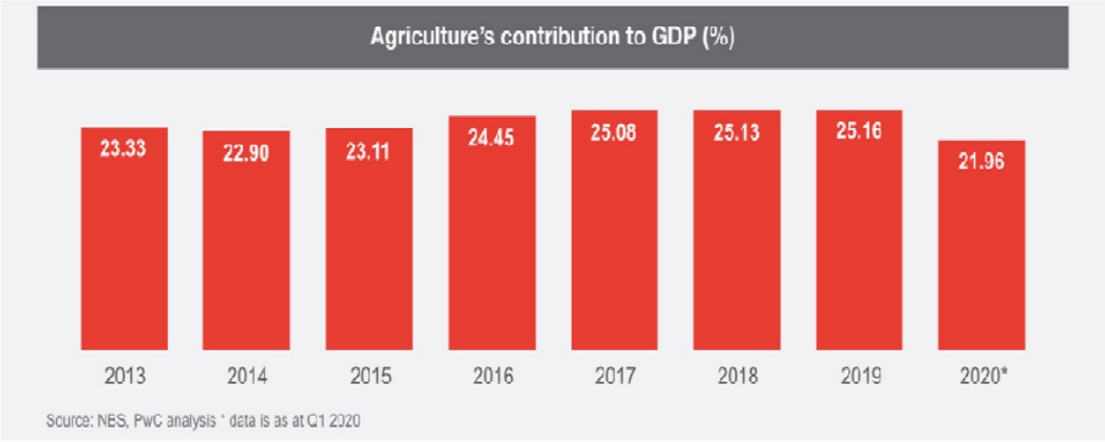
Food Economy: is a GDP driver via the sustainability of the human and ecological cost of what we eat.

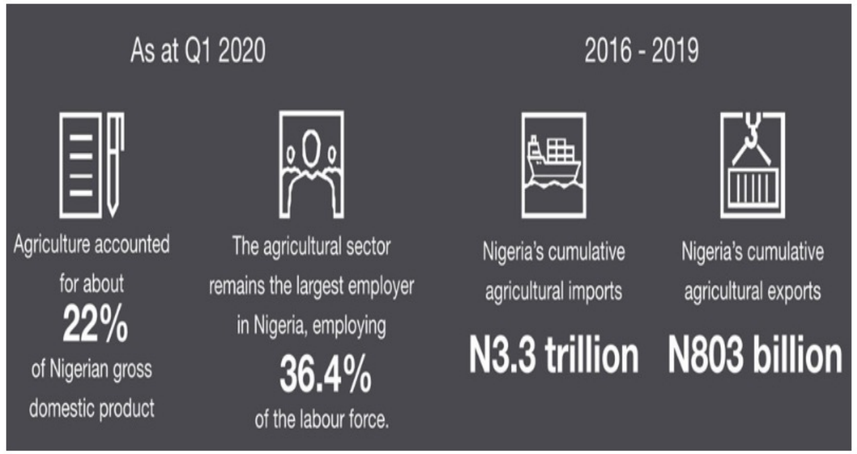
Food and nutrition security must be embedded in the growth paradigms for the new climate economies.

Knowledge Economy, is a GDP driver through skills using knowledge to create goods and services. Business Process Outsourcing in India today contributes 9.5% of the country's GDP and employs around 3.5 million people.

Agriculture Spotlight

- Nigeria Agriculture Sector has grown consistently at an average of 2.6% although CBN 2018 annual report states that agriculture sector grew at 2.12% based on Sectoral Growth Rates of GDP at 2010 Constant Basic Prices
- The Sector contributed 22% of the real GDP in Q1, 2020 compared to oil and gas 9.5%, manufacturing 9.7%, financial services 3.8% and trade 16.1%. *(PwC, June 2020. Responding to the Impact of Covid19 on Food Security and Agriculture in Nigeria).*
- Agric Sector remains the largest employer of Nigerian labor force of more than one-third (36.4%) *(PwC, June 2020. Responding to the Impact of Covid19 on Food Security and Agriculture in Nigeria).*
- Challenges of Agric sector includes; adverse weather condition, associated climate changes, herder-farmer clashes, North-east terrorism, cattle rustling, low levels of mechanization and poor research and development activities.
- Nigeria is well positioned to gain from Agric development given its vast arable and strong demand for farm produce. This growing demand for food is due to the growing population of more than 200million people of which 43.5% are younger than 15yrs old. *(http://population.un.org/wpp/data/query/)*. Nigeria growth rate has outpaced the rate of food production.





Cash Crops and Exports

Short Description of Data for Selected Crops

- Nigeria is referred to as the 49th largest export economy globally and indicated as the 124th most complex economy by the Economic Complexity Index (ECI) in 2017. Moreover, in 2017, Nigeria total export value of $46.8billion and total import value of $34.2billion giving a positive trade balance of $12.7billion *(The Observatory of Economic Complexity (OEC) (2019).*
- Cassava production in Nigeria reached the highest level with an estimated value of 59, 485,947million tons and accounted for 21% world share in 2017 with an export value of $1.25million *(Olutosin A Otekunrin and Barbara Sawicka (2019). Cassava, a 21st Century Staple Crop: How can Nigeria Harness Its Enormous Trade Potentials? ACTA SCIENTIFIC AGRICULTURE (ISSN: 2581-365X) Volume 3 Issue 8 August 2019).*

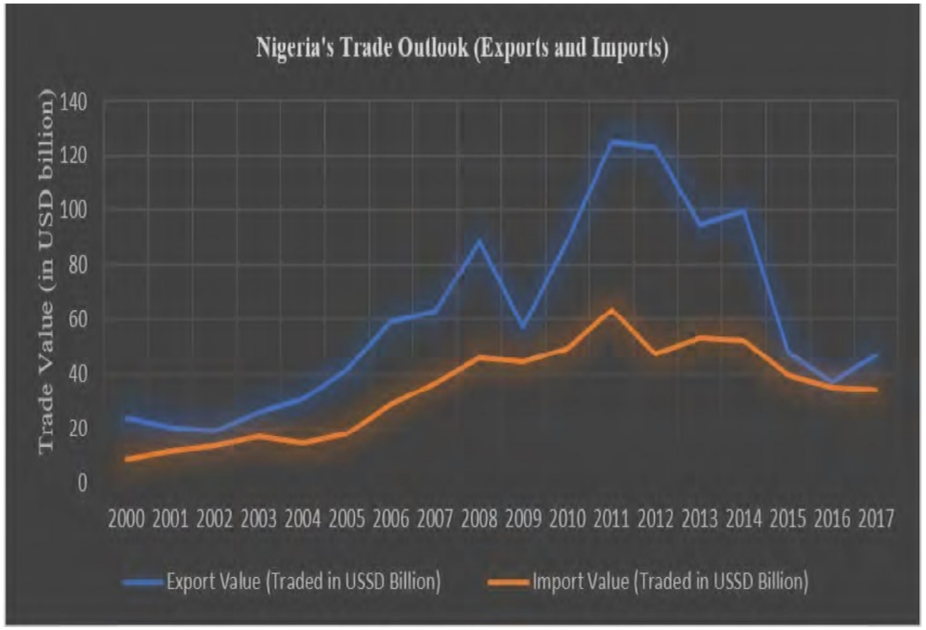


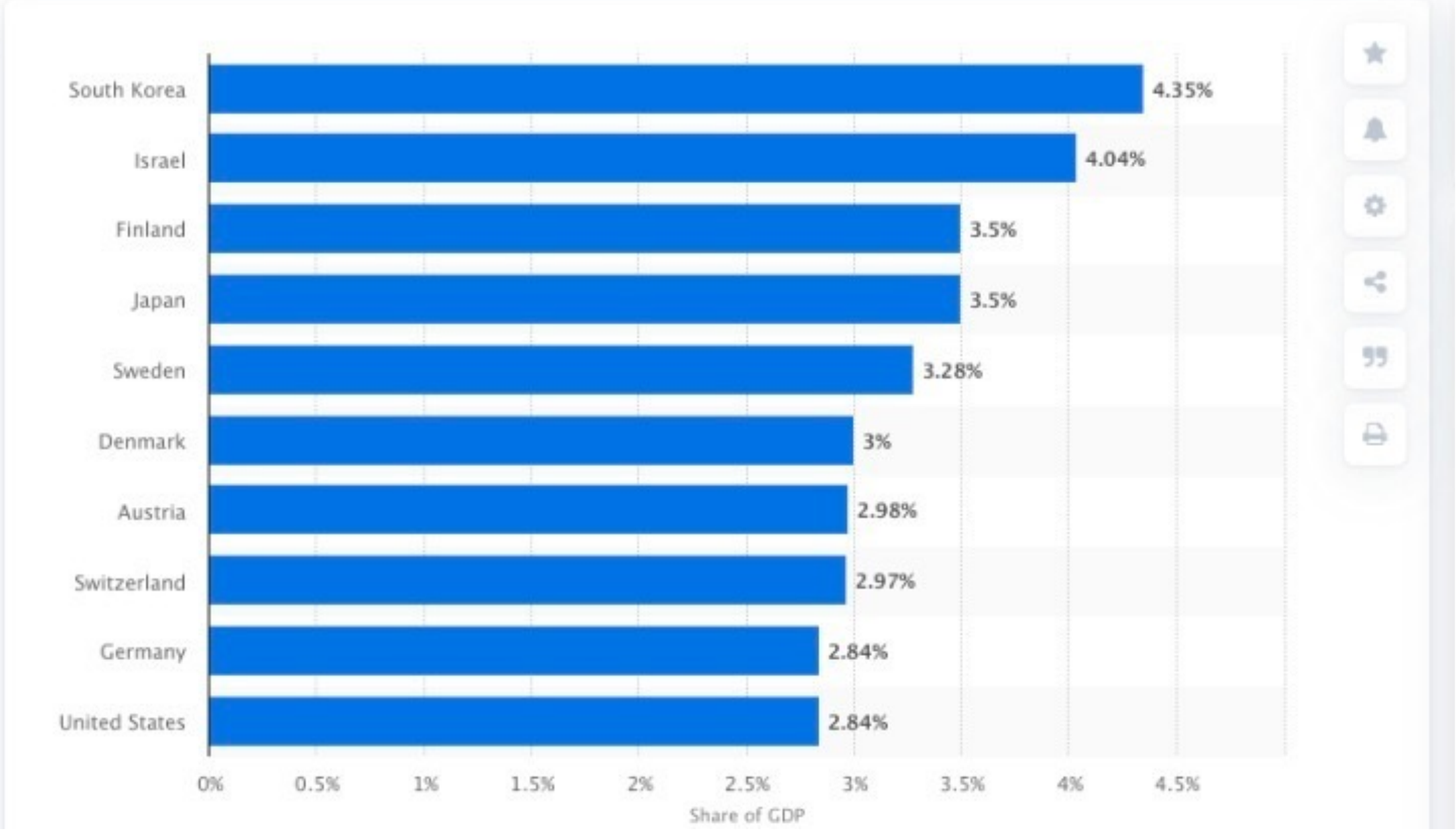
Table Showing Nigeria's trade outlook (exports and imports 2010 -2017)

Source: Authors' graph using OEC 2019

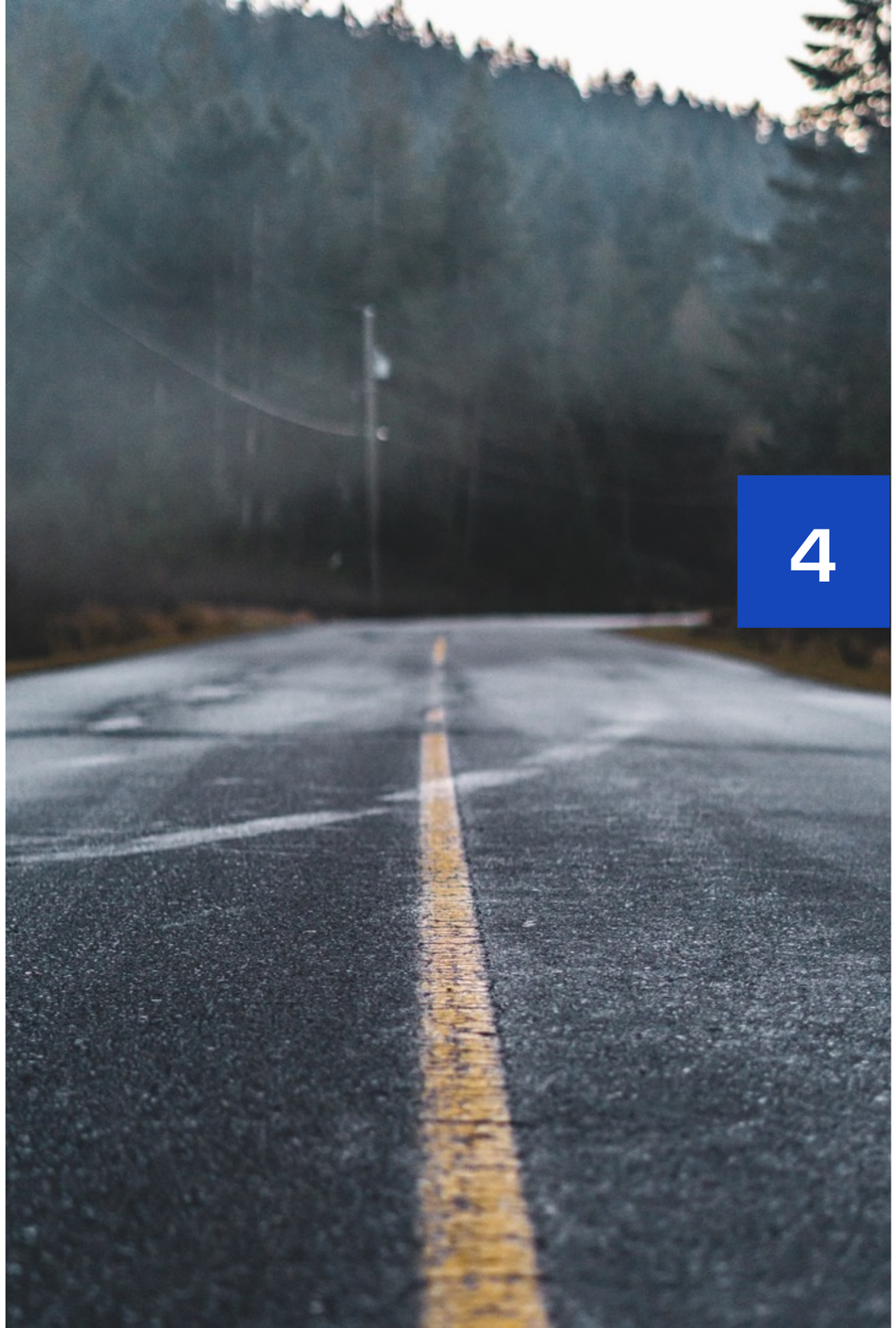
Cassava is grown in virtually all the states in Nigeria but there are 11 states that are recognized as major cassava producing states in Nigeria, these are Benue, Kogi, Enugu, Imo, Cross-River, Ondo, Ogun, Delta, Anambra, Edo and Taraba States *(FGN. Cassava Master Plan: A Strategic Action Plan for the Development of the Nigerian Cassava Industry (2006), Wossen, T., et al. "The cassava monitoring survey in Nigeria". Final Report. IITA, Ibadan, Nigeria (2017). ISBN 978-978- 8444-81-7. 66.)*

Research and Development is Key

Leading countries by research and development (R&D) expenditure as share of gross domestic product (GDP) worldwide in 2020



Nigeria needs to invest heavily in Research and Development



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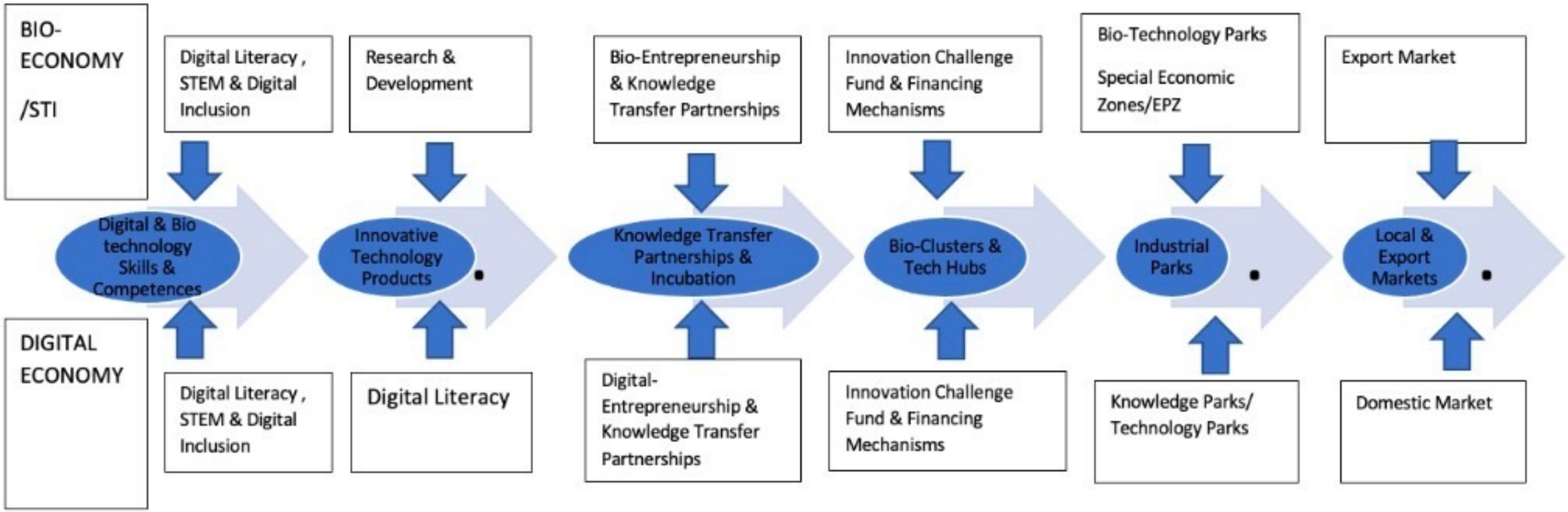
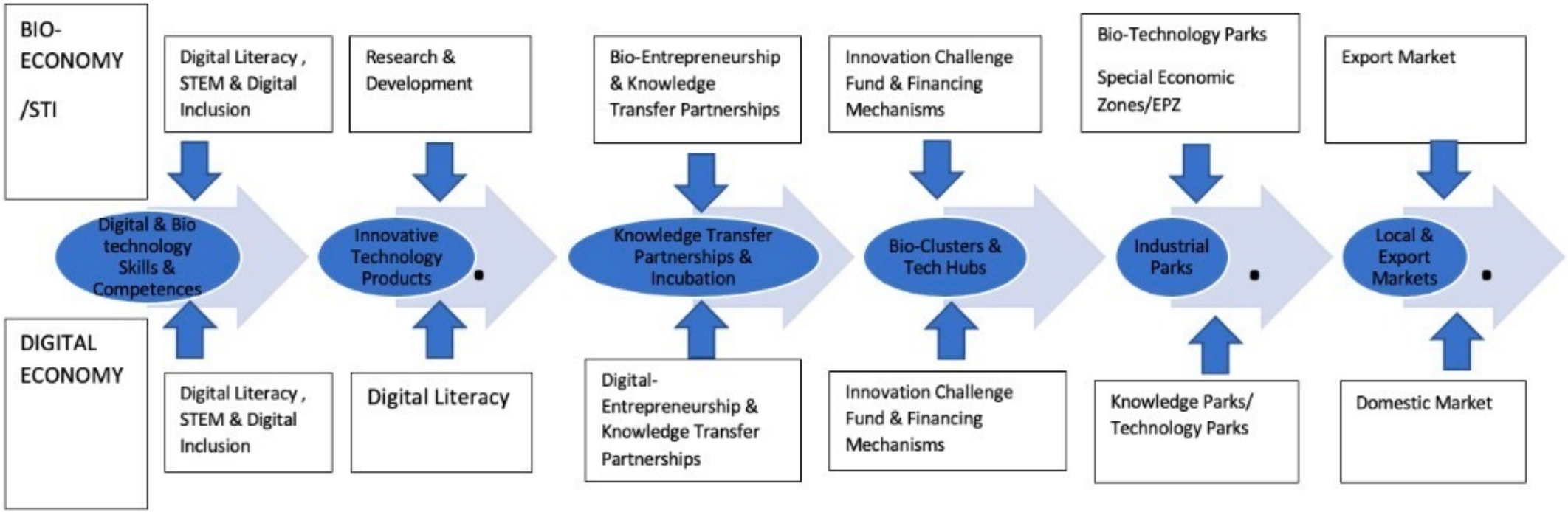
Vision for a New Economy

Our Broad Vision for the Future



Our Broad Vision for the Future



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Our Broad Vision for the Future

2025	2030	2050
Upskill youth participation in Gig Economy	Nigeria's contribution to Gig Economy now 15% of global market . Nigeria GDP $1.64tr	Quantum Leapfrog achieved with Nigeria's GDP in Top 10 globally-$6.4tr
Digital economy to make our Finance (Fintech) and Education (EdTech) Top 20 sectors globally	Agriculture (AgTech) and Healthcare (Healthtech) transformed as part of global 20	Telco, Fintech, EdTech, AgTech and Energy alone making up 45% of total GDP
Lay foundation for STI to replace Oil	Lower Middle-income Country	Upper Middle-income Country
Strong bioeconomy in 3 crop areas	Nigeria emerging as food basket of Africa	

Implication on the High Growth Cluster Sectors

HIGH GROWTH CLUSTERS

VERTICAL SECTORS – DIGITAL ECONOMY

SUPERCHARING THE TWG	Social Sector	Agriculture	Culture and Tourism	Housing	Oil and Gas	Solid Mineral, Mining and Steel Development	Healthcare	Financial Sector and Capital Markets
Digital Infrastructure	Network and data connectivity	Network and data connectivity	Network and data connectivity	Network and data connectivity	Satellite Imaging System	Satellite Imaging System		
Digital Government	National Social Register	Database of all Farm inputs and Farm clusters	Database of all Tourism destinations Digital photobook and virtual tours					
Digital Platforms	eLearning platforms	Offtaking platform to democratize sales and distribution Modern Farming techniques	Streaming local content (Netflix) Digital broadcast channels	Peer to Peer House sharing (AirBnB)			eHospitals eDoctors	
Digital Financial Services	Mobile Money Payments Digital Wallets	To facilitate payments to rural farmers, financially including them		Mortgage Micro payments				Cryptocurrency Blockchain Tokenized Stock Exchange
Financing	Cash Transfers Micro Loans	Security free financing for farmers to increase output. De-risking agric.						

Implication on the High Growth Cluster Sectors

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HIGH GROWTH CLUSTERS

VERTICAL SECTORS – BIOECONOMY

SUPERCHARING THE TWG	Social Sector	Agriculture	Culture and Tourism	Housing	Oil and Gas	Solid Mineral, Mining and Steel Development	Healthcare	Financial Sector and Capital Markets	Security & Defence
Food Security and Nutrition									
Green Growth									
Biomedical and Bipharmaceutical									Bio-security /Bio-terrorism
Biotechnology and Bioenergy									Bio-safety
Bio-entrepreneurship									

Recommendations

In coming up with recommendations, we asked ourselves the question: What kind of Nation and economy do we want to build in Nigeria?

1. Do we want to become the food basket for Africa (AGRICULTURE, BIOECONOMY, ICT)?

2. Do we want to become the center for trade (TRADE AND FINANCIAL HUB)

3. Technology Leadership and Services due to youth (TECHNOLOGY & CYBERSECURITY)

4. Energy Technology for the region? (ENERGY)

Recommendations

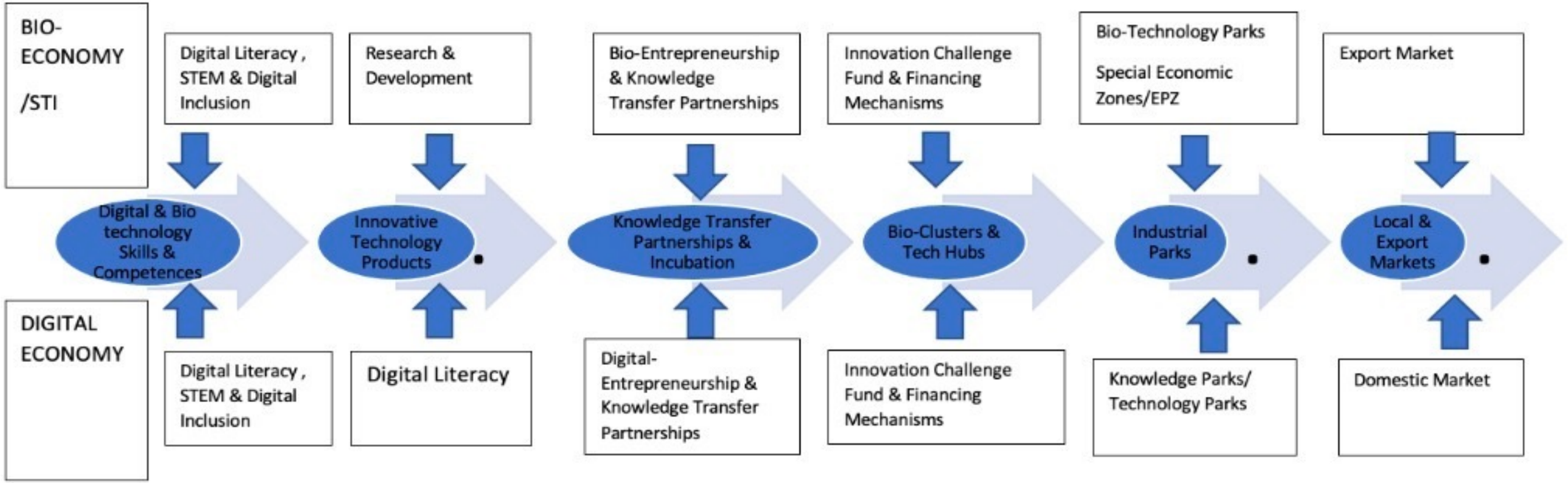
NO	ISSUE	EXPLANATION & PROPOSED SOLUTION
1	**VISIONING**	Need for “Visioning” and “Foresight “ exercise for envisioning the ‘Leapfrog Scenario’ for the High Growth cluster
2.	**HOLISTIC STRATEGY**	Policy and Strategic Documents that are omnibus and holistic
3.	**SKILLS**	Revamp of STEM curriculum in Primary, Secondary and University, and align to the future jobs. Increase emphasis on technical education, vocational schools and talent accelerators for Digital Economy and Bio-Economy
4.	**ENTREPRENEURSHIP**	More emphasis on Entrepreneurs as the lever for economic growth. Government should build bridges to Technical and Entrepreneurial diaspora talent globally
5.	**R&D SPEND**	Increase in Research and Development spend.
6.	**INNOVATION FUND**	Catalyze Private Sector Investment through Private Equity, Venture Capital, Incubators, Accelerators, etc and through Government involvement - Creation of an innovation fund via BOI, NSIA, CBN and others
7.	**DATA, STATS, M&E**	Investment in Data, Statistics and country level M&E. Planning is key
8.	**ECOSYSTEM ZONES**	Accelerate the good work that the Ministry of Communications and Digital Economy has started in refreshing all policies and strategy Ecosystem Approach and Special Economic Zones
9.	**NATIONAL INNOVATION**	The case for a National Innovation System
10.	**SECTOR FOCUSED CROSS_CUTTING**	To harness cross-cutting nature, need to develop a cohesive sector-focused IT strategy and policies, e.g. Financial inclusion strategy, Healthcare ICT policy, ICT policy for Social sector, EdTech ICT strategy
11.	**GIG ECONOMY INCUBATORS**	Invest in regional incubators, accelerators and the gig economy

MORE ON COLLABORATION PATHWAYS FROM BIO-ECONOMY PERSPECTIVES

MORE ON COLLABORATION PATHWAYS FROM BIO-ECONOMY PERSPECTIVES

- 1) SKILLS AGENDA, ENTREPRENEURSHIP & EMPLOYMENT (HUMAN CAPITAL DEVELOPMENT)
- 2) QUALITY INFRASTRUCTURE, COMPETITIVENESS, EXPORT MARKET ACCESS
- 3) RESEARCH, DEVELOPMENT, INNOVATION AND KNOWLEDGE TRANSFER PARTNERSHIP
- 4) INNOVATION FUNDING MECHANISMS & INNOVATION CHALLENGE FUND
- 5) SDG MAPPING
- 6) INVESTMENT & ONE STOP SHOP
- 7) CENTRE OF EXCELLENCE IN KEY BIOECONOMY SUB-SECTORS
- 8) SECURITY & TECHNOLOGY GOVERNANCE
- 9) MONITORING & EVALUATION FRAMEWORK

1) SKILLS AGENDA, ENTREPRENEURSHIP & EMPLOYMENT (HUMAN CAPITAL DEVELOPMENT)



MAPPING COMPETENCE LEVELS & DOMAINS OF BIO-TECHNOLOGY & BIO-ENTREPRENEURSHIP

COMPETENCE LEVEL	AWARENESS	UNDERSTANING & UNDERPINING KNOWLEDGE	PRACTICAL EXPERIENCE	DEMONSTRABLE COMPETENCE
DOMAIN	COGNITIVE DOMAIN	AFFECTIVE DOMAIN	PSYCHO-MOTOR	

1) SKILLS AGENDA, ENTREPRENEURSHIP & EMPLOYMENT (HUMAN CAPITAL DEVELOPMENT)

THE MANY VISIONS OF NIGERIA

- VISION 20: 2020 — 20TH Largest economy
- VISION 2030 — GDP $1.64Trillion (PwC); 300m population
- VISION 2050 — GDP $6.4 Trillion (PwC); 450m population

- 2030 DEMOGRAPHIC TIME-BOMB
- 300m people; population growth rate of 3.2%; Urbanisation rate of 4.6%; Rural-Urban migration from 50% to 75%; Average age of farmers 60 - 65yrs; Life expectancy 54yrs; High unemployment could be as high as 35-45% in 2030; Poverty prevalence: about 40% below poverty line; Agro-ecological food footprint shrinking due to crisis in all geo-pollical zones, and yet, young people are not going into farming. Women (80+80+80).
- DRAWING ON LATENT COMPARATIVE ADVANTAGE
- Africa has 90m MSMEs, of which 44m are from Nigeria, yet Nigeria is about 18% of Africa population.
- Nigeria Diaspora remit $26b every year

MORE ON COLLABORATION PATHWAYS FROM BIO-ECONOMY PERSPECTIVES

- 2) QUALITY INFRASTRUCTURE, COMPETITIVENESS, EXPORT MARKET ACCESS
- **Establishment of Biotechnology Quality Infrastructure:** Establish Biotechnology Professional Certification, and build the relevant quality infrastructure, quality standards and quality assurance systems to participate in Company and Biotechnology Products Certification and Validation, working with SON, NAFDAC, Plant Quarantine and International Certification Agencies. The quality Infrastructure include:

- ❑ Quality Standards;
- ❑ Certification;
- ❑ Traceability
- ❑ Metrology;
- ❑ Product Testing
- ❑ Sanitary & Phyto-Sanitary Requirement;
- ❑ Technical Specifications; etc

- ➢ Legislation of Certification Authorities for Biotechnology Professionals and for Certification of labels, standards, companies, processes and products in conjunction with NAFDAC, SON, Plant Quarantine and International Certification Agencies
- ➢ Legislation relating to Biosafety and Biosecurity regulations and protection
- ➢ New Food Safety and Health Act to reflect Biotechnology issues and challenges.

Educational Infrastructure:

- Establishment of common infrastructure to support teaching, learning, research and development activities in the field of biotechnology accessible to all stakeholders (undergraduates , post graduate students & research fellows)

- 3) RESEARCH, DEVELOPMENT, INNOVATION AND KNOWLEDGE TRANSFER PARTNERSHIP

- **Education -Industry Partnership**: Strengthening the interface between university & industry to enhance employability; improvement in infrastructure & human resource development

- **Triple-Helix /Quadruple – Helix Knowledge Transfer Partnership**: Strengthening collaborative research between universities, research & development agencies, private sector and government
- Promote knowledge transfer partnership hubs - that brings the universities(academia), R&D institutes; private sector and govt together to actualise innovative research outputs through incubation, production, manufacturing, to the market (relevant to another funding window - fabrication intervention projects).

MORE ON COLLABORATION PATHWAYS FROM BIO-ECONOMY PERSPECTIVES

- 4) INNOVATION FUNDING MECHANISMS & INNOVATION CHALLENGE FUND

➢ An Act establishing National Bioeconomy Commission

➢ An Act establishing Innovation Challenge (Trust) Fund, and drawing 1 – 3% of the Consolidated Revenue Fund; 1% Pre-tax Innnovation Levy payable by Medium and Big Technology Related/Manufacturing Companies; Draw-down of 5 to 10% of existing funds such as TETFund, Petroleum Trust Fund; Ecological Fund etc

- 5) SDG MAPPING

SOCIAL INCLUSION & SUSTAINABILITY (HEALTH, EDUCATION, EMPLOYMENT, POVERTY REDUCTION & SDG)

a. By 2025, at least 0ne million Nigerian Youth will be skilled in Bio-entrepreneurship and Innovation technologies, and 10 million new jobs created

b. By 2025, Bioeconomy will contribute substantially to the achievement of our Nigeria's Sustainable Development Goals (SDG 1,2,3,4,7,8,10,11,13,14,15 & 17)

MORE ON COLLABORATION PATHWAYS FROM BIO-ECONOMY PERSPECTIVES

- 6) INVESTMENT & ONE STOP SHOP
- **ONE STOP SHOP**: Establish ONE STOP SHOP technology support services - digital on-line library; state of the art diagnostic and testing centres; patent registration centre; 'one stop shop' for bio-technology acquisition and transfer and incubation; national gallery and exhibition centre of biotec inventions; convention centre and residential training etc

- 7) CENTRE OF EXCELLENCE IN KEY BIOECONOMY SUB-SECTORS
- **Establishment of Centres of Excellence in the fields/subsectors of Biotechnology:** Work towards developing into Centre of excellence in biotechnology and related disciplines

RED BIOTECHNOLOGY

- Health branch and responsible for the development of more than 250 vaccines, antibiotics and regenerative therapies

GREEN BIOTECHNOLOGY

- Used by more than 13million farmers to fight pests and nourish crops

WHITE BIOTECHNOLOGY

- Improves manufacturing processes including development of biofuels to make industries more efficient

YELLOW BIOTECHNOLOGY

- Focused on food production, eg reduction of levels of saturated fats in cooking oils

BLUE BIOTECHNOLOGY

- Exploits marine resources to obtain aqua-culture, cosmetics and healthcare products

GREY BIOTECHNOLOGY

- Conservation and restoration of contaminated natural ecosystems through bioremediation

GOLD BIOTECHNOLOGY

- Also known as bio-informatics, is responsible for obtaining, storing, analysing and separating biological information, especially that related to DNA and amino-acid sequences.

Fabrication Centre: Fabrication centre intervention for bio-incubation projects

International Translational Research Partnership: Promote translational research with partner international organizations such as the Biotechnology Research Society of India (BRSI) and the International Bioprocessing Association – International Forum for Industrial Bioprocessing (IBA-IFIBiop)

MORE ON COLLABORATION PATHWAYS FROM BIO-ECONOMY PERSPECTIVES

- 8) SECURITY & TECHNOLOGY GOVERNANCE
- How to use technology to address security challenges and enhance defence capabilities.
- Themes:
- Cyber security
- Defence and Cyber Space
- Spectrum Management and regulatory enforcement/5G
- Bio-safety
- Bio-security/Bio-terrorism
- Assistive technologies and people with disabilities

- MONITORING AND EVALUATION FRAMEWORK

SUMMING UP

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Working with other TWGs – Centre of Excellence in Biotechnology sub-sectors

HIGH GROWTH CLUSTERS

VERTICAL SECTORS – BIOECONOMY

SUPERCHARING THE TWG via SUB-SECTORAL CENTRES OF EXCELLENCE	Social Sector	Agriculture	Culture and Tourism	Housing	Oil and Gas	Solid Mineral, Mining and Steel Development	Healthcare	Financial Sector and Capital Markets	Security & Defence
Red Bio-technologies									
Green Bio-technologies									
White Bio-technologies									
Yellow Bio-technologies									
Blue Bio-technologies									
Grey Bio-technologies									
Gold Bio-technologies									
Fabrication Centres									

Implication on the High Growth Cluster Sectors

NG2050

HIGH GROWTH CLUSTERS

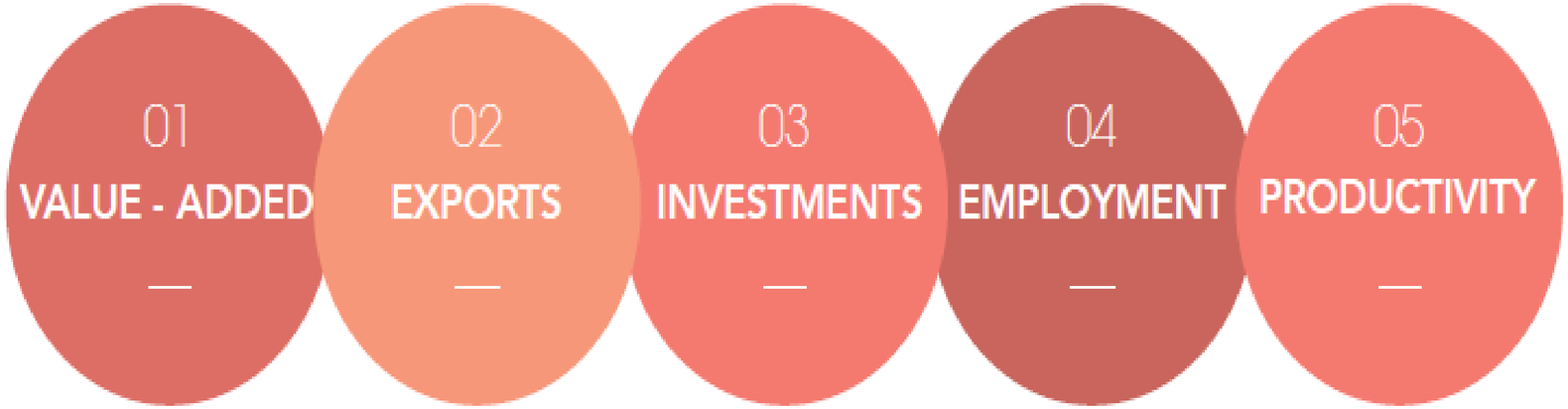
VERTICAL SECTORS – BIOECONOMY

SUPERCHARING THE TWGs IN THE THEMATIC AREAS	Social Sector	Agri-culture	Culture and Tourism	Housing	Oil and Gas	Solid Mineral, Mining and Steel Development	Healthcare	Financial Sector and Capital Markets	Security & Defence
1)SKILLS AGENDA, ENTREPRENEURSHIP & EMPLOYMENT (HUMAN CAPITAL DEV.)									
2)QUALITY INFRASTRUCTURE, COMPETITIVENESS, EXPORT MARKET ACCESS									
3)RESEARCH, DEVELOPMENT, INNOVATION AND KNOWLEDGE TRANSFER PARTNERSHIP									
4)INNOVATION FUNDING MECHANISMS & INNOVATION CHALLENGE FUND									
5)SDG MAPPING									
6)INVESTMENT & ONE STOP SHOP									
7)CENTRE OF EXCELLENCE IN KEY BIOECONOMY SUB-SECTORS									
8)SECURITY & TECHNOLOGY GOVERNANCE									
9)MONITORING & EVALUATION FRAMEWORK									

MEASURING BIO-ECONOMY CONTRIBUTION & MONITORING FRAMEWORK

A) ADDING UP THE GDP OF THE SUB-SECTOR COMPONENTS

B) USING BIO-ECONOMY CONTRIBUTION INDEX (BCI)– a single comprehensive index which combines:



Value added, bio-based exports, bioeconomy investment, bioeconomy employment and productivity performance

Targets/P.I./Output/Baseline. Nigeria spends about US$ 22 billion (N7.92 trillion)per year on major food imports

Bio-product	World Production	Nigeria's Import	Nigeria's Production	Remarks	01- Value Added	02- Exports	03- Investments	04- Employment	05- Productivity	06 Imports
Cotton Seed	25.8 m tons $59.7b export market (2018) and $72.6b ('23)	Textile import is $376m (N114.7b – first 3 Qtrs of 2018)	Nigeria produces 95,000 M tons based on yield of 1 ton of seed cotton per Ha.	Nigeria export of Cotton is $8.3m(2018). NABDA seed yield 5 tons/Ha	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25
Yam and Yam Seed	73.0million tonnes		47million tonnes About $7.6b (N2.3t)- 2018	Nigeria grows 70% of World Yam,. Ghana about 4% but Ghana exports 70% of UK Yam	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25
Tomatoes	160million tons (2019)	1.2m tons values at $2.5b	1.701m tons	140,848 farmers in 25 states financed under CBN Anchor program	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25
Rice	740.3 m tons, 90% grown in Asia (FAO'19)	Consumes 7m tons/yr $1.65 b (N0.59 trillion)	3.7m tons (USDA '19)	1.6m farmers grew 1.7m Ha. Yield from 2tons to 6tons per Ha	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25
Wheat	764.39 million tons (2020)	$1.35billion	60,000 tons	SA produces 1,600,000 tons, Sudan 600,000 tons	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25
Sugar	175million tons	$1.87b import ('19) 5.54mtons	Target production of 1.7million tons		'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25	'21 '22 '23 '24 '25

6

Digital Economy, Bio-Economy, Science, Technology and Innovation

Cross Cutting Goals For the DEBSTI Sector

S/N	BROAD STRATEGIC STATEMENT	CROSS-CUTTING GOALS
1	FUNDING: By 2025, Nigeria has a funding plan for the DEBSTI programmes and initiatives to foster its quantum leapfrog scenario.	CCG 1- Improved access to long term funding and risk capital (de-risk investment in R&D) CCG 2- Increase foreign and domestic resource mobilization, and in particular***, the Innovation Challenge Fund*** CCG 3- To have public and private finance system supporting the DEBSTI ecosystem including ***Venture/Private Equity Capital and Blended Finance***
2	POLICY AND GOVERNANCE: By 2025, Nigeria has a central working policy and governance framework to propel the 'quantum leapfrog scenario' of the DEBSTI.	CCG 4- To have a fiscal and monetary policy that promotes funding for all the DEBSTI sectors. (***Innovation Challenge Fund/ Blended Finance etc)*** CCG 5- To have a central working policy framework for DEBSTI CCG 6- Creating an all-encompassing bioeconomy policy and robust Institutional framework ***(National Bioeconomy Commission) with representation from key MDAs***
3	SKILLS: By 2025, Nigeria shall achieve a literacy of at least 60% across the DEBSTI sectors.	CCG 7- To attain a level of skills acquisition and entrepreneurship necessary in the DEBSTI sectors which include digital literacy, financial literacy, STEM and vocational skills at scale using technology.(***eg e-learning)*** CCG 8- To revamp educational curriculum to prepare students from the elementary level to tertiary level for DEBSTI sectors.
4	INFRASTRUCTURE: By 2025, Nigeria would have increased digital and quality infrastructure to boost the quantum leapfrog scenario of the DEBSTI.	CCG 9- To increase digital, assistive and adaptive technology infrastructure (broadband, last mile of connectivity, digital identity, automation, assistive/adaptive) by 25% across the DEBSTI with a view to ensuring high level of digital inclusion CCG 10- To ensure a business environment that allows DEBSTI sectors thrive by improving ease of doing business ranking through digitization of key government processes and activities, and as well as ensure improvement in all socio-economic performance indicators and human capital development indices. CCG 11- Improved National Quality Infrastructure by implementing the National Strategy for competitiveness in Raw Materials and Product Development and stronger compliance with export quality standards and readiness.

Goals for Digital Economy

S/N	BROAD STRATEGIC STATEMENT	CROSS-CUTTING GOALS
1	**<u>CONNECTED SERVICES</u>: Statement 1: By 2025, Nigeria has matured to "Connected Services" as a functional e-Governance nation. ("Connected Services" is one of the stages in the 4 stages of maturity of e-governance by the United Nations)**	**G1 -** By 2025, the Nigerian Government would have attained a fully mature state of e-Governance Development referred to as ' **Connected Presence'**. **G2 -** Every Nigerian to have access to purchase data, at a maximum, of N200 ($0.5) per 1GB by 2025. (NB: Data prices just crashed by 50% in 2020, dropping to N200 per GB of data)
2	**<u>DIGITAL ECONOMY CURRICULUM</u> Statement 2: By 2025, Nigeria has fully integrated digital economy curriculum and institutions that produce digital skills/4IR skills that drive employment, entrepreneurship – including from primary schools; vocational schools – producing 10 million new digital economy workers in the next 5years.**	**G3 -** Fully integrated digital economy curriculum and institutions that produces digital skills/4IR skills that drives employment, entrepreneurship – from primary schools; vocational schools – producing 2 million new digital economy workers annually. **G4 -** Digital Economy, Research and Innovation is positioned as a national agenda with the proper governance framework and government funding
3	**<u>GIG ECONOMY</u> Statement 3: By 2025, Nigeria digital economy workers are participating in the global gig economy, upskilling and generating finances from the global gig economy market size**	**G5 -** By 2025, 30% of Nigeria's national work force are gig economy workers **G6-** MSMEs in Nigeria are actively involved in the global gig economy to meet the global gig economy market size
4	**<u>FUNDING ECOSYSTEM</u> Statement 4: By 2025, Nigeria has a mature funding ecosystem that catalyzes private sector investment and FDI into innovation producing 5 Unicorns (Billion Dollar [$1b] home grown successful enterprises)**	**G7 -** By 2025, Nigeria has a mature funding ecosystem that catalyzes private sector investment and FDI into innovation Nigeria producing 5 Unicorns – homegrown successful enterprises **G8 -** By 2025, rollout at least 5 new Incubators and innovation hubs in every state, which is focused on creating the support ecosystem (research, universities, government, funders) for Entrepreneurs to thrive
5	**<u>DATA INFRASTRUCTURE</u> Statement 5: By 2025, Nigeria has invested heavily in its national and sub-national data infrastructure; culture of data driven decision making; and within the private sector, data driven business models and enterprises.**	**G9** - Nigeria has invested heavily in its national and sub-national data infrastructure which includes its states' infrastructure. **G10-** Nigeria has a culture of data driven decision making; and within the private sector, data driven business models and enterprises.
6	**<u>INTELLECTUAL PROPERTY & LOCAL CONTENT</u> Statement 6: By 2025, Nigeria has a revamped intellectual property guideline that encourages local innovation & protects Intellectual Property ownership; Nigeria is meeting the targets of its local content in contribution to demand for digital enterprises**	**G11 -** Revamp Nigeria's intellectual property such that it encourages local innovation. **G12 -** To increase Nigeria's local content participation in Information and Communications Technology (Hardware, Software, Human Resources) in Public and Private sector contracting.

Goals for Bio Economy

S/N	BROAD STRATEGIC STATEMENT	CROSS-CUTTING GOALS
S7	**<u>EXPORT OF BIOECONOMY PRODUCTS</u> Statement 7: By 2025, Nigeria's bioeconomy sector would have made a significant contribution to the economy attended by an increase in the export of bioeconomic products where Nigeria has comparative advantage (including but not limited to indigenous food crops, industrial bio-resource materials, herbs, aquaculture, bio-mass, bioenergy, forestry/biodiversity among others).**	**G13-** To deepen Bioeconomy contribution to all sectors of agriculture and agricultural processing to boost the economy by an increase in the export of bioeconomic products where Nigeria has comparative advantage (including but not limited to indigenous food crops, industrial bio-resource materials, herbs, aquaculture, biomass, bioenergy, forestry/bio-diversity among others). **G14-** Increase Bio based product Innovation and production in the food and beverage industry by 30% to meet domestic demand for enzymes, fragrances, amino acids, natural food additives, probiotics, Lupin protein foods, soya bean peptides, and increase the production of ***platform chemicals/intermediary products*** for the production of bio-plastics; synthetic fibers/plant tannings, bio-based concretes/admixtures, bio-process equipment/reactors; bio-lubricants; car interior linings/reinforced car body parts; bio-ethanol/synthetic fuels; etc.
S8	**<u>REDUCED IMPORTATION OF BIOECONOMY PRODUCTS</u> Statement 8: By 2025, importation of Bioeconomy products (Pharmaceutical and Biomedical products and equipment) will be reduced by 10% etc.**	**G15 -** Increase indigenous production of biochemical, biomedical and bio-pharmaceutical products and equipment by 50%, ***including Active Pharmaceutical Ingredients (API) and Platform Chemicals***. **G16-** Manage and maximise the value chain of Traditional / herbal medicine towards providing health and economic benefit to the country
S9	**<u>REGULATION</u> Statement 9: By 2025, Nigeria would have designed, revised and implemented robust Biosafety and Biosecurity national strategies and plans.**	**G17 -** To improve and strengthen Biosafety and Biosecurity regulation, planning and implementation in Nigeria. **G18 -** To promote an efficient and effective regulation of modern and emerging biotechnology products and services, and build the necessary quality infrastructure to assure product quality, conformity assessment and statutory compliance.

Goals for Bio Economy

S/N	BROAD STRATEGIC STATEMENT	CROSS-CUTTING GOALS
S10	**<u>SDGs CONTRIBUTION</u> Statement 10: By 2025, Bioeconomy will contribute substantially to the achievement of Nigeria's Sustainable Development Goals (SDG 1,2,3,4,7,8,10,11,13,14,15 & 17)**	**G19 -** To consistently generate innovative and tailored fit solutions in bio-economy, green energy, green economy, circular economy, waste control, bio-diversity and other areas of importance through research and innovation. **G20 -** To improve the achievement of Sustainable Development Goals (SDGs).
S11	**<u>BIO- ENTREPRENEURSHIP AND COMPETITIVENESS</u> Statement 11: By 2025, Bioeconomy contribution to GDP will increase by strengthening bio-entrepreneurship and competitiveness through policy alignment, coordination, local and strategic partnerships, quality infrastructure, knowledge and innovative technology transfer at all levels of government with Academia, R&D, Private Sector and Civil Societies using quadriple-helix models**	**G21 -** Increase strategic and local partnerships for Bioeconomy based economic development and increase the bioeconomy products and services contribution to GDP, and in particular: ▪ Red Biotechnology ▪ Yellow Biotechnology ▪ Green Biotechnology ▪ Grey Biotechnology ▪ White Biotechnology ▪ Blue Biotechnology ▪ Gold Biotechnology **G22 -** Promote bio-entrepreneurship and other skills development agenda **G23 -** To build partnerships and knowledge sharing among academia, R&D institutions, private sector/industry & government (using quadruple helix models) so as to take innovative products to the market, and build the quality infrastructure required to support and assure product quality, conformity assessment requirements and statutory compliance.

Goals for Science, Technology and Innovation

S/N	BROAD STRATEGIC STATEMENT	CROSS-CUTTING GOALS
S12	**POLICY DEVELOPMENT & REVIEWS:** **By 2025, Nigeria will have an effective and coordinated policy framework for Innovation, Education, Science & Technology**	**G24.** National Innovation Policy is detached from the current STI Policy, and implemented with clear linkage to economic priorities and involving a wider range of strategic and local stakeholders and partners **G25**. Comprehensive review of the 2012 S&T Policy **G26**. Presidential Executive Order or Policy required to prioritize STEM education at basic education level
S13	**INNOVATION SYSTEM:** **By 2025, Nigeria has functioning National Innovation System**	**G27**. To establish a National Research and Development Foundation **RESEARCH & INNOVATION COUNCIL** **G28**. To reorganize National Research & Innovation Council with wider representation of Industry, Ministries and Academia, through the coordination of National Office for Innovation **ECOSYSTEM DEVELOPMENT** **G29**. To carry out Innovation System Mapping at regional and national and sub-national levels **TRIPLE – HELIX MODEL** **G30.** To ensure the framework for adopting the triple-helix model is implemented as well as technology foresight programme **STI INDICATORS** **G31**. Year on Year (YoY) Monitoring & Evaluation (M&E) reports on STI indicators to track improvements will have been commenced

Goals for Science, Technology and Innovation

S/N	BROAD STRATEGIC STATEMENT	CROSS-CUTTING GOALS
S14	**UPDATE EDUCATION SECTOR** **By 2025, the Ministerial Strategic Plan for the Education sector reform will have been completed**	**POLICY IMPLEMENTATION** **G32.** To revamp school curriculum and position education to meet the demands of 4th Industrial Revolution (4IR), and promote STEM Education, digital literacy, at all levels of education. **CURRICULUM REVIEW** **G33.** To prioritize entrepreneurship education, and digital skills delivered as part of the education curricula (by digital economy masterplan into the education reform strategy
S15	**R&D OUTCOMES** **By 2025, Nigeria will have achieved significantly improved R&D outcomes and contributions to key sector growth**	**INTELLECTUAL PROPERTY** **G34.** To increase Patent applications by 35%, resulting from problem solving research **TERTIARY INSTITUTIONS** **G35.** To ensure ALL Universities and Polytechnics have DVC/Deputy Rectors on R&D **G36**. To upskill 10,000 researchers (in research institutes and academia on grant writing, for improved ability to attract competitive research funding. Award 3,000. PhD scholarships in specific high growth sectors: Agriculture, Digital Economy, Bio-economy etc **PARTNERSHIP** **G37**. To develop and implement framework to promote multi-disciplinary and multi partner research projects (to facilitate research collaboration between research groups in academia, public and private research institutes, and the private sector through the building of multidisciplinary laboratories in each geo-political zone. **G38**. To initiate and launch a national research collaboration strategy (to bring Nigeria into the global arena), and thereby participate in local and international research consortia. **INFRASTRUCTURE** **G39.** To improve research infrastructure through audit of laboratory assets in all public research institutions and provision of direct funding strategy for both upgrading maintenance of research equipment and research undertaken by public research institutes (NgREN is research infrastructure) **G40.** To have 18 new S&T Parks established across the country

Goals for Science, Technology and Innovation

S/N	BROAD STRATEGIC STATEMENT	CROSS-CUTTING GOALS
S16	**<u>COMMERCIALIZATION</u>** **By 2025, The business climate is improved with better sector engagement in R&D, technology commercialization is achieved.**	**G41**. To reduce the rate of failure in the SME & MSME sub-sector by 15% through the introduction of management extension services in SMEs, by: ➢ By graduating individuals with better entrepreneurial skills ➢ By taking industry problems as an input into University research work ➢ By improving on commercializing research ideas **G42**. To improve the conversion of research ideas to new business **G43** To increase the number of SMEs employing between 50 – 199 workers from 5,000 to 15,000; those employing 10 – 49 workers from 68,000 to 100,000 **G44**. To improve the National Quality Infrastructure by implementing the National Strategy for competitiveness in raw materials and product development and stronger standards monitoring.

THANK YOU