
NIGERIA'S INTENDED NATIONALLY DETERMINED CONTRIBUTION

1. National Context

In 2014, Nigeria became the largest economy in sub-Saharan Africa. Nigeria is a lower middle income developing country, the GDP per capita in current US\$ is about \$2,950. The economy is diversifying and has grown over 6% per year for the past decade. Yet, significant challenges remain. Food insecurity, poor access to energy and high unemployment, amongst others, remain principal constraints on economic development and are of primary concern to the government. Those below the poverty line of US\$1.25 PPP still make up 30% of the population. The recent sharp decline in world oil prices has put pressure on the federal government budget, which continues to depend significantly on export revenues. The Nigeria INDC, therefore, focuses on the delivery of direct development benefits and sustainable growth of the economy.

In addition to these challenges, the country is considerably impacted by climate change. The north of the country, for example, is highly vulnerable to drought. A recent Pew Research Center global attitudes survey¹ found that 65% of Nigerians are very concerned about the threat climate change poses, ahead of global economic instability (48%). HE President Buhari has stated in his inaugural speech that Nigeria is committed to tackling climate change. Nigeria's INDC demonstrates its determination to contribute to the success of the Paris climate summit in December 2015 and to grow its economy sustainably while reducing carbon pollution.

The INDC promotes sustainable development and delivering on government priorities. The policies and measures included in the Nigeria INDC will deliver immediate development benefits and do not compromise sustainable growth, on the contrary. Ambitious mitigation action is economically efficient and socially desirable for Nigeria, even when leaving aside its climate benefits. The policies and measures alleviate poverty, increase social welfare and inclusion, as well as improving individual well-being, which includes a healthy environment. Furthermore, by not undertaking these measures Nigeria would incur significant adaptation costs from exacerbated climate change.

Nigeria has been actively engaged in international climate policy negotiations since it became a Party to the UN Framework Convention on Climate Change (FCCC) in 1994 ratifying its Kyoto Protocol in 2004. Nigeria submitted its First National Communication (FNC) in 2003 and a Second National Communication in February 2014. Nigeria is host to a number of Clean Development Mechanism projects, as well as projects financed by the Adaptation Fund. In September 2012, the Federal Executive Council approved the Nigeria Climate Change Policy Response and Strategy. HE, President Muhammadu Buhari, The President of the Federal Republic of Nigeria on 26 November 2015, approved the Nigeria INDC.

1 Summary

The table below summarises Nigeria's INDC.

Table 1: Summary of key aspects of Nigeria's INDC

Aspect	Detail																								
Type of objective	Reduction from Business as Usual (BAU)																								
Target year	2030																								
Implementation Period	2015-2030																								
Base data period	2010-2014																								
Summary of objective	Economic and social development: grow economy 5% per year, improve standard of living, electricity access for all																								
Unconditional and conditional mitigation objectives	20% unconditional, 45% conditional																								
Key measures	<ul style="list-style-type: none"> • Work towards ending gas flaring by 2030 • Work towards Off-grid solar PV of 13GW (13,000MW) • Efficient gas generators • 2% per year energy efficiency (30% by 2030) • Transport shift car to bus • Improve electricity grid • Climate smart agriculture and reforestation 																								
Trajectory [update figure once agreed]	<table border="1"> <caption>Carbon Dioxide Equivalent Emissions (Millions of tonnes)</caption> <thead> <tr> <th>Year</th> <th>Business As Usual</th> <th>Unconditional</th> <th>Conditional</th> </tr> </thead> <tbody> <tr> <td>2010</td> <td>330</td> <td>330</td> <td>330</td> </tr> <tr> <td>2015</td> <td>420</td> <td>420</td> <td>420</td> </tr> <tr> <td>2020</td> <td>520</td> <td>500</td> <td>450</td> </tr> <tr> <td>2025</td> <td>650</td> <td>580</td> <td>470</td> </tr> <tr> <td>2030</td> <td>900</td> <td>700</td> <td>480</td> </tr> </tbody> </table>	Year	Business As Usual	Unconditional	Conditional	2010	330	330	330	2015	420	420	420	2020	520	500	450	2025	650	580	470	2030	900	700	480
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2010	330	330	330																						
2015	420	420	420																						
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2030	900	700	480																						
Emissions per US\$ (real) GDP	0.873 kg CO ₂ e (2015) [0.491 kg CO ₂ e (2030)]																								
GDP per capita (US\$)	2,950 (2014) 3,964 (2030; real 2015 US\$)																								

Estimated emissions per capita	Current: around 2 tonnes CO ₂ e 2030 BAU: around 3.4 tonnes CO ₂ e 2030 Conditional: around 2 tonnes CO ₂ e
Global Warming Potentials used	IPCC Fourth Assessment Report
Cost Estimate Data	National Cost = \$142b; National Benefits = \$304b (World Bank report “Low Carbon Development Opportunities for Nigeria” (2013))
Gases covered	CO ₂ , N ₂ O, CH ₄
Emissions as % of global total	<1% (2010)
Historical emissions (1850-2010)	2,564.02 million tonnes

Under a business-as-usual growth scenario, consistent with strong economic growth of 5% per year, Nigeria’s emissions are expected to grow to around 900 million tonnes per year in 2030, which translates to around 3.4 tonnes per person. The key measures below could potentially reduce emissions by around [45%] compared to business as usual.

Yet, Nigeria has a great potential for climate smart development, given support for implementation. Much of the reduction potential identified has zero net cost or indeed achieves a net economic benefit. That is, the measures would benefit Nigeria overall, even before taking into account the climate benefits.

Table 2: Key mitigation measures

Measure	Potential GHG reduction (million tonnes per year in 2030)
Economy-wide energy efficiency	179
Efficient gas power stations	102
Work toward ending of gas flaring	64
Climate smart agriculture	74
Reduce transmission losses	26
Renewable energy	31

2 National Development Strategy and Planning

In recent years, two development strategy documents have directed the development process in Nigeria:

- i. **Vision 20:2020:** The Federal Government’s economic growth plan, *Nigeria Vision 20:2020, Economic Transformation Blueprint* (2009), recognizes the changing

climate as a threat to sustainable growth in the next decade. It sees climate change as a critical challenge globally and, in Nigeria, as a potential driver of “*damaging and irrecoverable effects on infrastructure, food production and water supplies, in addition to precipitating natural resource conflicts.*” This recognition is an important first step towards a climate change adaptation strategy and action plan.

- ii. **Transformation Agenda 2011 – 2015:** The agenda converts the full suite of priority policies and programs into projects, in order to ensure continuity, consistency and commitment of national development efforts. It identified 1613 projects across from 20 Ministries.

In retrospect, however, the policy and implementation framework did not adequately address issues of climate change.

2.1 Climate Change Policy Framework

In order to reflect the increasing importance of climate change issues in Nigeria, the Federal Executive Council adopted in 2012 the *Nigeria Climate Change Policy Response and Strategy*. To ensure an effective national response to the significant and multi-faceted impacts of climate change, Nigeria has adopted a comprehensive strategy, as well as a number of specific policies. The strategic goal of the *Nigeria Climate Change Policy Response and Strategy* is to foster low-carbon, high growth economic development and build a climate resilient society through the attainment of the following objectives:

- ✓ Implement mitigation measures that will promote low carbon as well as sustainable and high economic growth;
- ✓ Enhance national capacity to adapt to climate change;
- ✓ Raise climate change related science, technology and R&D to a new level that will enable the country to better participate in international scientific and technological cooperation on climate change;
- ✓ Significantly increase public awareness and involve private sector participation in addressing the challenges of climate change;
- ✓ Strengthen national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional framework for climate change governance.

Nigeria has adopted adaptation policies and measures described in more detail in section 3.2.2.

2.2 Climate Change Adaptation

2.2.1 Impacts and Vulnerability

The impacts of climate change in Nigeria vary in extent, severity and intensity. In the absence of in-depth quantitative research the economic costs can only be approximated. The following summary shows what is at risk:ⁱⁱ

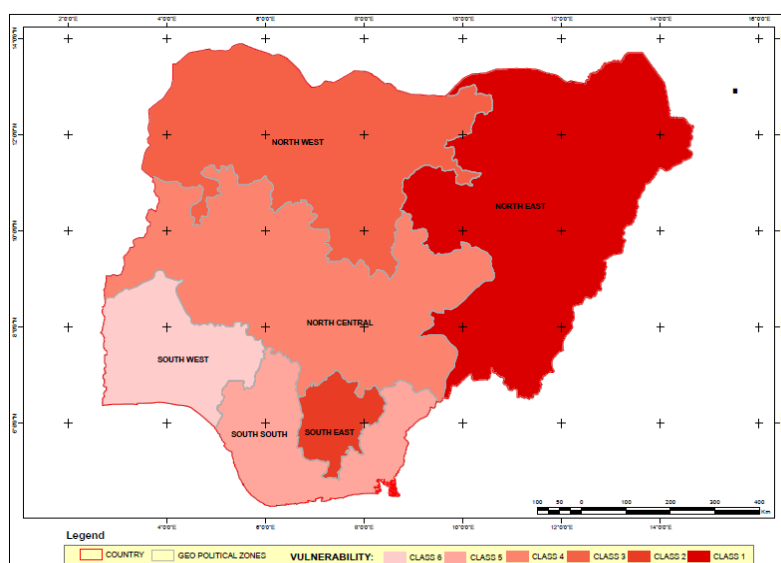
- **Overall Economy:** According to a 2009 DFID study, if no adaptation action is taken, between 2-11% of Nigeria’s GDP could be lost by 2020. The Post Disaster Need Assessment (PDNA) Report following 2012 flood revealed that the total damage caused by the disaster amounted to \$16.9billion, representing 1.4% of real GDP growth in that year. In this regard, climate change poses a significant threat to the achievement of development goals, especially those related to eliminating poverty and hunger and promoting environmental sustainability.
- **Agriculture and Food Security:** Agriculture is one of the sectors most sensitive to climate change. Under a business-as-usual scenario, agricultural productivity could decline between 10 to 25 per cent by 2080. In some parts of the north, the decline in yield in rain fed agriculture could be as much as 50 percent. This in turn would impact GDP, reducing it by as much as 4.5 percent by 2050,ⁱⁱⁱ even though the share of agriculture in GDP will decline from 40 to just 15 percent. Furthermore, in the

absence of mitigating measures, the net import of yams and other vegetables is expected to decrease in the long-term. The net import of rice, however, is expected to increase by as much as 40 percent.

- **Water:** A considerable proportion of the population is at risk of water stress, with less than 40% having direct access to potable water. Climate change brings increased variability in rainfall, resulting in flooding in some humid areas in the south in the country and a decrease in precipitation in the savannah north. This may result in droughts and decrease in surface water resources in the north. It is possible that changes in surface runoff and groundwater flows in shallow aquifers can be linked to climate variability with long-term implications for permanent and seasonal water bodies. The rapid shrinking of Lake Chad from about 45,000 km² in 1960 to less than 3,000 km² in 2007 is mainly attributed to changes in the climatic conditions in the region. Hydro-electric power generation suffers frequently from low in-flow into the dams and water transportation along inland channels has also been negatively impacted. (Federal Ministry of Environment, 2010).
- **Floods and Droughts:** Climate change would result in increased variability in rainfall, predictably resulting in floods in many parts of the country, particularly the humid areas, with devastating consequences. Single extreme climate events have the potential to wipe out years of development. For example, the total value of destroyed physical and durable assets caused by the 2012 floods has been estimated to be ₦1.48 trillion (US\$9.5 billion) or about 2% of the rebased GDP of US\$510 billion.
- While floods may further ravage the humid areas to the south, a decrease in precipitation is expected in the savannah north. This may result in increased drought frequency and decrease in surface water resources, thus increasing its dependence on underground water sources. The increasing aridity in the northeast of the country has drastically reduced opportunities for sustainable agriculture and is considered a contributing factor to the current conflict and high degree of insecurity in the region.
- **Soil Erosion:** Climate change-related heavier and steadier than normal rainfall that is expected in the southern part of the country will worsen soil erosion that is already of catastrophic condition in the sub-region. Recent increase in the number of reported severe landslides in south eastern States of the country is an attestation to the possible climate change-induced changes in erosion intensity.
- **Sea Level Rise:** Nigeria's coastline is already undergoing pronounced morphological changes as a result of natural extreme events, such as sea surges and tidal waves. Global warming-induced accelerated sea level rise (ASLR), anticipated to be 0.5 - 1m this century, would exacerbate the poor condition of the country's coastline. With specific reference to the Niger Delta, it is estimated that with an ASLR of about 0.5m, about 35% of the highly-productive delta could be lost. With ASLR of about 1.0 m by 2100 (French et.al., 1995) about 75% of the delta could be lost.
- **Energy:** Climate change will have significant effects on the energy sector in Nigeria. In particular, rising temperatures would result in increased energy demand for air conditioning, refrigeration and other household uses. This in a context of severe shortages of energy supply.
- **Tourism:** Tourism, one of Nigeria's fastest growing industries, could be negatively affected as many tourist attractions are located along the coastal zone of the country. Traditional festivals (e.g. the Argungu River festival in Kebbi State) attracting many tourists may be impacted by reduced river flow.
- **Ecosystems:** Forests and other ecosystems, already under significant pressure, would be adversely affected by climate change. Persistent flooding and water logging could make coastal forest regeneration more difficult. On the other extreme, the savannah biome of northern Nigeria would be very vulnerable to a reduction in rainfall in the region. This could result in degradation of habitats and the intensification of desertification.

The summary of impacts above shows Nigeria to be highly vulnerable to climate change. The 2014 World Climate Change Vulnerability Index, published by the global risk analytics company Verisk Maplecroft, classifies Nigeria as one of the ten most vulnerable countries in the world. A recent government study determined vulnerability across Nigeria's geographical regions, focusing on the three principal determinants of vulnerability: adaptive capacity, sensitivity and exposure. The *relative vulnerability* of the six geopolitical zones of Nigeria is shown below. There is a general south-north divide. The three northern zones show higher vulnerability than those in the south. This reflects the higher rainfall and socio-economic development of the south. The south-south shows highest relative variability among the three southern zones, reflecting the challenges of coastal flooding and erosion, as well as the impact of petroleum exploration and exploitation in that part of the country.

Figure 1: Spatial variation in relative climate change vulnerability (Second National Communication, 2013)



The southwest is least vulnerable, the northeast, on the other hand, is most vulnerable. Understanding these spatial vulnerabilities is crucial to shaping climate-resilient development in Nigeria.

2.2.2 Adaptation Policy Framework

Nigeria's response to climate change has focused on increasing resilience and managing the unavoidable impacts. The ***National Adaptation Strategy and Plan of Action for Climate Change Nigeria (NASPA-CCN)*** describes our adaptation priorities, bringing together existing initiatives and priorities for future action. The 2011 NASPA-CCN Vision is a Nigeria in which climate change adaptation is an integrated component of sustainable development, reducing the vulnerability and enhancing the resilience and adaptive capacity of all economic sectors and of all people – particularly women, children, and resource-poor men – to the adverse impacts of climate change, while also capturing the opportunities that arise as a result of climate change. Our goal is to take action to adapt to climate change by reducing vulnerability to climate change impacts and increasing the resilience and sustainable wellbeing of all Nigerians; and to reduce or minimize risks by improving adaptive capacity, leveraging new opportunities, and facilitating collaboration inside Nigeria and with the global community.

To this end, a set of thirteen sector-specific strategies, policies, programmes and measures have been prepared, which are included in full in Annex 1 to this INDC. The objectives of these are to reduce the impacts of climate change through adaptation measures that can be

undertaken by the Federal, State and Local Governments, civil society, private sector, communities and individuals, including measures that will:

1. Improve awareness and preparedness for climate change impacts
2. Mobilize communities for climate change adaptation actions
3. Reduce the impacts of climate change on key sectors and vulnerable communities
4. Integrate climate change adaptation into national, sectoral, State and Local Government planning and into the plans of universities, research and educational organizations, civil society organizations, the private sector and the media.

In light of the INDC focus on mitigation potential in key sectors, we highlight below adaptation strategies for some high-emitting sectors:

Strategies, policies, programmes and measures for key sectors

A. STRATEGIES FOR AGRICULTURE (CROPS AND LIVESTOCK)

1. **Adopt improved agricultural systems for both crops and livestock (for example, diversify livestock and improve range management; increase access to drought resistant crops and livestock feeds; adopt better soil management practices; and provide early warning/meteorological forecasts and related information).**
2. **Implement strategies for improved resource management (for example, increase use of irrigation systems that use low amounts of water; increase rainwater & sustainable ground water harvesting for use in agriculture; increase planting of native vegetation cover & promotion of re-greening efforts; and intensify crop and livestock production in place of slash and burn).**
3. **Focus on agricultural impacts in the savanna zones, particularly the Sahel, the areas that are likely to be most affected by the impacts of climate change.**

B. STRATEGIES FOR FORESTS

1. **Strengthen the implementation of the national Community-Based Forest Resources Management Programme.**
2. **Support review and implementation of the National Forest Policy.**
3. **Develop and maintain a frequent forest inventory system to facilitate monitoring of forest status; and initiate a research programme on a range of climate change-related topics, including long term impacts of climatic shifts on closed forests.**
4. **Provide extension services to CSOs, communities and the private sector to help establish and restore community and private natural forests, plantations and nurseries.**
5. **Improve management of forest reserves and enforce low impact logging practice.**

C. STRATEGIES FOR ENERGY

1. **Include increased protective margins in construction and placement of energy infrastructure (i.e. higher standards and specifications).**
2. **Undertake risk assessment & risk reduction measures to increase resilience of the energy sector.**
3. **Strengthen existing energy infrastructure, in part through early efforts to identify and implement all possible 'no regrets' actions.**
4. **Develop and diversify secure energy backup systems to ensure both civil society and security forces have access to emergency energy supply.**
5. **Expand sustainable energy sources and decentralize transmission in order to reduce vulnerability of energy infrastructure to climate impacts.**

D. STRATEGIES FOR TRANSPORTATION AND COMMUNICATIONS

1. **Include increased protective margins in construction and placement of transportation and communications infrastructure (i.e. higher standards and specifications).**

2. Undertake risk assessment and risk reduction measures to increase the resilience of the transportation and communication sectors.
3. Strengthen existing transportation and communications infrastructure, in part through early efforts to identify and implement all possible ‘no regrets’ actions.
4. Develop and diversify secure communication backup systems to ensure both civil society and security forces have access to emergency communication methods.

E. STRATEGIES FOR INDUSTRY AND COMMERCE

1. Increase knowledge and awareness of climate change risks and opportunities
2. Undertake and implement risk assessments and risk reduction measures
3. Incorporate climate change into ongoing business planning
4. Review and enforce land use plans in industrial areas in light of climate change
5. Encourage relocation of high risk industries, facilities and markets
6. Promote and market emerging opportunities from climate change
7. Encourage informal savings and insurance schemes, and arrange for the availability of medium term credit (especially for industries in crisis).

F. STRATEGIES FOR VULNERABLE GROUPS

1. Adapt to our national, the World Meteorological Organization- Global Framework for Climate Services (WMO-GFCS) to Nigeria's needs (National Framework for Application of Climate Services - NFACS) to reduce vulnerability of communities through enhanced advocacy and implementation of the five Pillars of the Framework.

The National Agricultural Resilience Framework (NARF 2014) is based on principles of adaptive management and participatory engagement as the central tenets of the overall implementation strategy. The NARF articulates policy options, opportunities and required interventions to achieve the following strategic objectives:

- ✓ Strengthening the overall policy/institutional framework for improved resilience and adaptation to climate variability and change in the agricultural sector, including planning and implementation, systems for resource mobilization, and effective project monitoring and evaluation.
- ✓ Evaluation and introduction of risk transfer and risk management strategies (e.g., improved seasonal and real time weather forecasts, insurance based risk mitigation options etc.) into the agricultural sector and widespread deployment of same through communication technologies, including mobile phones.
- ✓ Improving productivity through training community and grass root farmers on land and water management strategies (e.g., irrigation farming, water harvesting, soil fertility enhancement and erosion control etc.) improved farming practices and using policy instruments such as economic incentives, regulations and communication.
- ✓ Reinforcing existing social safety nets through support systems that reduce vulnerability and improve livelihood conditions for the vulnerable, especially women and children.
- ✓ Improving farming systems research capacity within the National Agricultural Research System (NARS) to enable and support the implementation of climate friendly agriculture in Nigeria.
- ✓ Revamping extension services, including building new capacity for evidence-based assessment and management of climate risk for resilience in the agriculture sector.

In addition to the above-mentioned key climate change related policies, several other environmental and sectoral policies and plans implicitly address climate change issues. For example, the National Policy on Environment supports *“the prevention and management of natural disasters such as floods, drought, and desertification”* and one of the objectives of Nigeria’s Agricultural Policy is to *“protect agricultural land resources from drought, desert encroachment, soil erosion, and floods”*. Other examples include Nigeria’s *Drought Preparedness Plan, National Policy on Erosion and Flood Control, National Water Policy,*

National Forest Policy, and *National Health Policy*. The challenge facing the government is sustained and coordinated implementation of policies and measures across a whole range of sectors. This INDC will be instrumental in making progress in this regard.

3 Mitigation Contributions Summary

3.1 Business as Usual emissions projections

Nigeria's economy and population are both growing rapidly, and the population is attaining a higher standard of living. This growth will have a strong impact on future emissions. Following careful review of the re-based GDP data for 2010-2014^{iv} and official population projections the "business-as-usual scenario" was developed as part of the preparation of this INDC. This scenario assumes an economic growth at 5%, population growing at about 2.5% per year, all Nigerians to have access to electricity (both on-grid and off-grid) and demand is met, industry triples its size by 2030.

Under this scenario, emissions are projected to grow 114% by 2030 to around 900 million tonnes – around 3.4 tonnes for every Nigerian. Under a high growth scenario, with economic growth at 7%, this climbs to over one billion tonnes.

3.2 Mitigation potential assessment

The mitigation actions, which could be undertaken, were assessed in a bottom up manner, building on expert assessments of both the challenges facing individual sectors, as well as a review of policies and measures already in place. The measures included in Nigeria's INDC are expected to deliver significant development benefits. The mitigation actions that bring the largest development benefit are reducing air pollution, indoors and outdoors, with enormous immediate health and social benefits. Secondly, innovation in "clean" technologies brings resource efficiency and produces more knowledge and jobs than those in "dirty" technologies. Thirdly, fiscal reform is proving an efficient mitigation action. This releases significant resources in the budget that can fund investments in efficient infrastructure and other fiscal policies, thus creating jobs and fuelling growth. Beyond mitigation actions that could be quantified, several qualitative policies and measures have been identified.

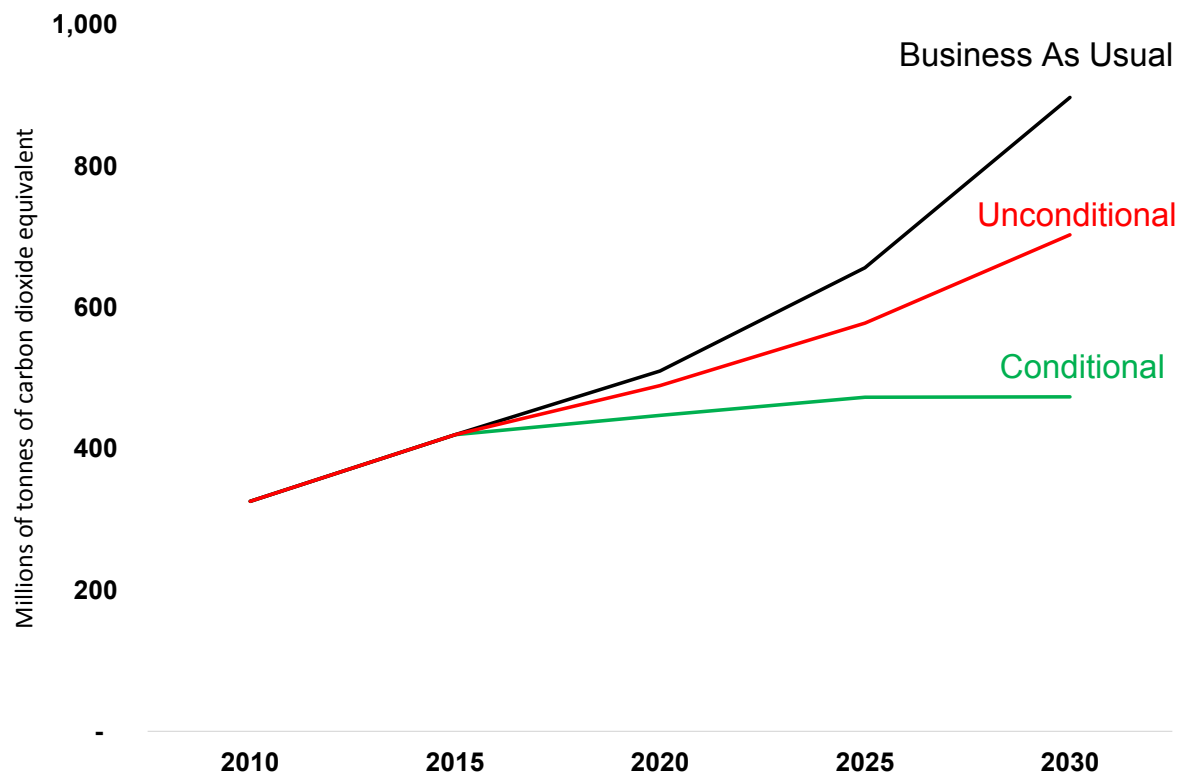
3.3 Unconditional contribution

In the event an ambitious, comprehensive legally binding global agreement is reached at COP21 in Paris, Nigeria will make an unconditional contribution of 20 per cent below BAU that is consistent with the current development trends and government policy priorities. The policies and measures that will deliver these savings are cost-effective, even at the current high interest rate, which constrains investment. They include improving energy efficiency by 20 percent, 13 GW of renewable electricity provided to rural communities currently off-grid, and ending gas flaring.

3.4 Contribution conditional on international support

Nigeria can make a significant additional contribution with international support, in the form of finance and investment, technology and capacity building. The combined policies and measures described below can deliver in a cost-effective manner direct development benefits to the country and reduce emissions 45 per cent below BAU. The key measures are an increased level of energy efficiency and a significant reduction in the use of generators, while providing access to energy for all Nigerians.

Figure 2: Mitigation contributions



4 Mitigation contributions

4.1 Background

For the purpose of developing the INDC, a LEAP model of the Nigerian economy and its emissions was constructed.^v By using a bottom-up approach to modelling, an economy-wide emissions contribution for 2030 could be prepared that is grounded in sector-based analysis. The Nigeria 2030 LEAP model contains references to all relevant data sources and key assumptions^{vi}.

The resulting package of policies and measures included in the Nigeria INDC prioritizes those actions that were quantifiable and cost-effective. The criteria against which potential mitigation actions were assessed were:

- ✓ Cost effectiveness
- ✓ Mitigation potential
- ✓ Poverty alleviation and job creation
- ✓ Feasibility of implementation
- ✓ Short-term results
- ✓ Gender and social inclusion
- ✓ Health and air quality
- ✓ Land (degradation) and water quality, incl. deforestation

The mitigation actions included in the INDC to a large extent implement or enforce existing policies or strategies. However, additional legislation and regulatory changes will be required. An assessment of the changes required to the regulatory and legislative framework will be undertaken upon finalization of the INDC.

The measures identified are as follows:

1. Energy
 - Renewable energy, particularly decentralized
 - Multi-cycle power stations
 - Scalable power stations of 20-50MW
 - Enforced energy efficiency
 - Use of natural gas rather than liquid fuels
2. Oil and Gas
 - Improved enforcement of gas flaring restrictions
 - Development of Gas-to-Power Plants at Gas Flare Sites (micro grid)
 - Blending 10% by volume of Fuel-Ethanol with Gasoline (E10) and 20% by volume of Biodiesel with Petroleum Diesel (B20) for Transportation Fuels.
3. Agriculture and Land Use
 - Climate Smart Agriculture
 - Stop using charcoal
4. Industry
 - Benchmarking against international best practice for industrial energy usage
 - Adoption of green technology in industry
5. Transport
 - Modal shift from air to high speed rail
 - Moving freight to rail
 - Upgrading roads
 - Urban transit

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- Toll roads/ road pricing
 - Increasing use of CNG
 - Reform petrol/ diesel subsidies

The portfolio of policies and measures by sector are described in more detail below. A brief problem statement for each sector precedes them.

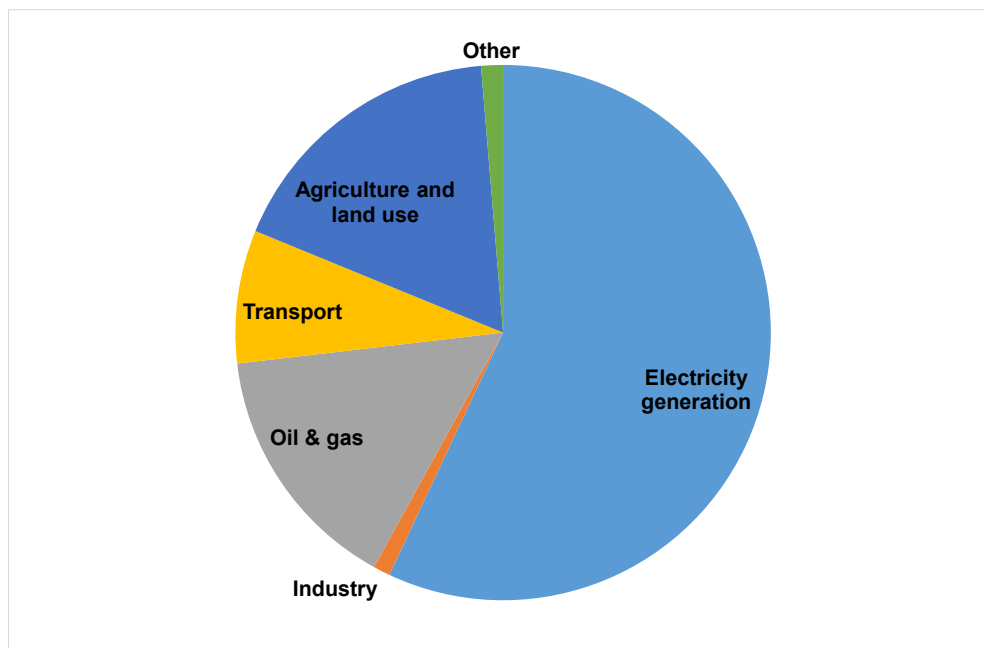
The INDC delivers immediate development benefits and the measures are cost-effective. Unfortunately, the cost of inaction could not be quantified. There are policies and measures that are not cost-effective today but would deliver significant climate and other benefits in the medium to long term. These can only be implemented with significant international support.

The urgent challenge is that in the current fiscal situation those measures that require large upfront investment, even if cost effective over the life of the investment, will be carefully reviewed before being implemented.

4.2 Mitigation actions by sector

Figure 3 below shows the major sectors where emission reductions take place in the conditional contribution.

Figure 3: Source of 2030 emission reductions by sector



4.2.1 Agriculture, forests and land use change

The livelihoods of Nigeria's poorest farmers are already at risk from climate change. Rising temperatures, too little rain or too much rain, thriving pests all lead to crop losses. Without access to improved seeds, fertilizer and appropriate technologies, such as irrigation systems and finance, Nigeria's food security will be at risk. With growing food demand from a growing population, declining harvests would strain supply, increasing malnutrition and possibly reverse recent progress in alleviating poverty. Improving agriculture is a central part of Vision 20:2020. The ambitions laid down in the Agricultural Transformation Agenda (ATA) cannot, however, be met without climate smart agriculture (CSA). CSA seeks to address the combined challenges of food security and climate change. Its aims are to sustainably increase agricultural productivity and support equitable increases in farm incomes, enhancing food security and development. It is also aimed at adapting and building

resilience of agricultural and food security systems to climate change, thus, reducing greenhouse gas emissions from crops, livestock and fisheries. Farmers take agro-ecological measures that increase the resilience of the farming systems, as opposed to such measures that promote high external input farming, industrial meat production and large-scale industrial agriculture, which contribute to climate change. The benefits of improved practices go beyond improved yields. With improved yields come improved diets, growing productivity and reinvestment in rural communities, it puts children back in school. Improved productivity results in reduced food imports and reduced emissions. Appropriate incentives to farmers, and training, will be important. The best incentive for farmers is likely to come in the form of improved yields. Ultimately, the livelihoods of the poorest farmers are secured, as is security at large. This is important even though the share of the sector in the economy is reducing.

One example is agroforestry, where trees are mixed with crops and animals on the same land, can be another option for carbon fixing and for providing mulch material. Estimates of the benefits from agroforestry range from total (lifetime) emissions reductions of 158 million tonnes to 712 million tonnes. Another example is a reduction of methane emissions from livestock, through improved feeding and breeding.

Halting deforestation and the conservation of remaining natural forests, as well as reversing forest degradation is important. A failure to do so undermines the productive capacity of the land, as well as key ecosystems. The use of fuel wood and charcoal for fuel is also a major source of degradation of Nigeria's forests. By some estimates, at the current rate of deforestation, there will be no significant forest remaining in a few years' time, unless strong action is taken. It must, however, be recognized that charcoal provides essential fuel for many in Nigeria and its use cannot simply be reduced without providing alternatives. Efficient cookstoves are one way to reduce fuel demand, and alternative heating sources such as LPG could be provided. To what extent the use of LPG – a fossil fuel – delivers a genuine climate benefit, compared to wood-based charcoal, needs to be considered. Further work is needed in this regard.

The overall cost per tonne of mitigation achieved in the sector is assumed to be negligible because the non-carbon benefits of the measures justify the costs. However, farmers may need assistance, because there may, for example, be upfront costs which low-income farmers will need help to meet.

4.2.2 Gas Flaring

The flaring of associated gas is illegal, the reality is a different one. There is a lack of gas infrastructure, until recently a relative lack of domestic demand for natural gas, and no transparent gas market. It has also been suggested that the subsidization of other fuels makes gas less attractive than it should be. Penalties are low and enforcement weak, the benefits of utilization accrue elsewhere. As a result of the foregoing, the companies responsible for ending the flaring have at present little incentive to do so. Gas flaring was responsible for around 48 million tonnes of emissions in 2010^{vii}. Yet it is possible and cost-effective to Nigeria to reduce and ultimately end the practice.

There are many potential productive uses for this gas such as feeding industrial clusters with a centralized gas supply. This would combine well with other options, such as increased use of natural gas (e.g. CNG) in transport and in power generation. The key difficulty may be enforcement, but the benefits are large. Eliminating flaring by 2030 could save around 64 million tonnes of CO₂ per year.^{viii} The World Bank estimates that this would have a net benefit of \$61 per tonne. It could combine well with other mitigation measures such as substitution of natural gas-fired electricity generation for diesel generators.

4.2.3 Energy

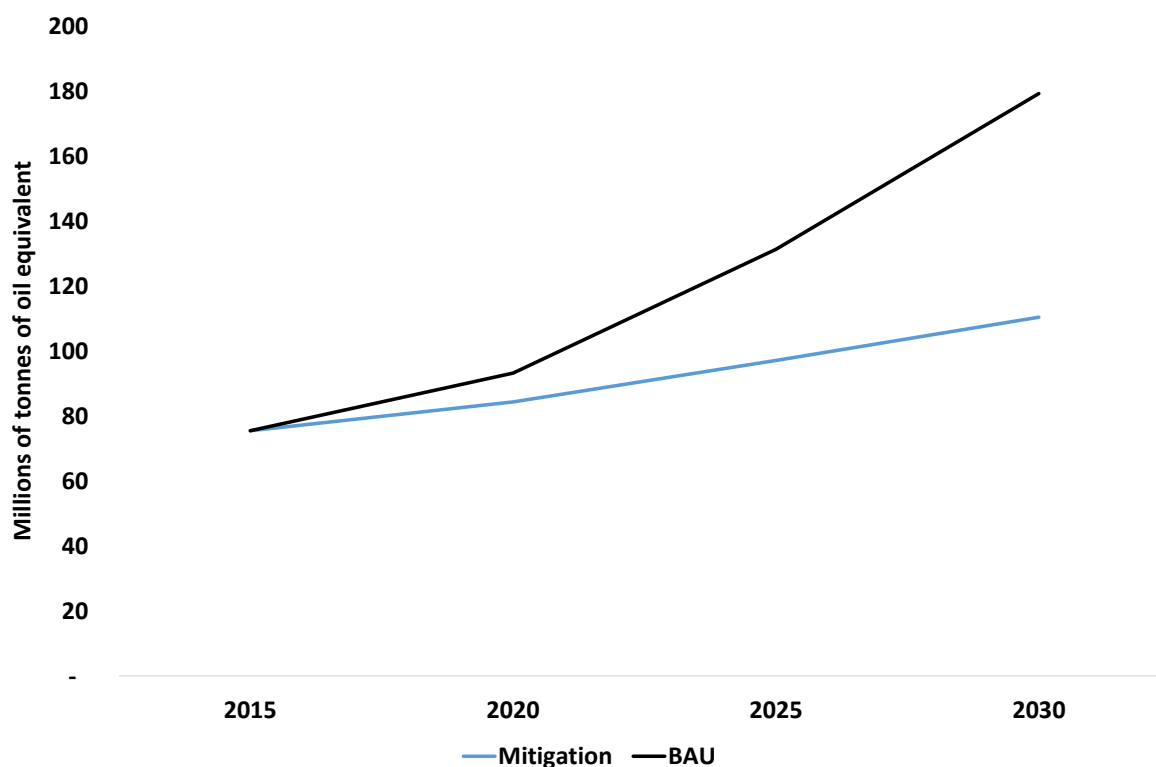
The government has made addressing the need to provide access to energy for all Nigerians a priority. At present, a significant share of demand for energy, and electricity in particular, remains unmet. The current grid is unable to reliably serve the existing industrial and urban

customer base. A shortfall in generation capacity has led to the proliferation of small generators, which are inefficient and polluting. Most rural communities remain off the grid, about 60% of the population lack access to electricity. At the current rate of grid expansion they will largely remain under-served. The potential to both provide energy access and to reduce emissions is enormous. The mitigation options for energy address both energy demand and energy supply.

This can be achieved through implementation of three significant policies. Firstly, reliable gas-powered generation, using associated gas currently flared, can replace small generators. Secondly, rural electrification will be driven by cost-efficient renewable solutions. Thirdly, energy efficiency is greatly improved so as to reduce overall demand for energy and in doing so serve more people, faster.

In many cases, energy efficiency measures are cost-effective. Yet, the upfront costs of these measures can be an important challenge. In the short-term, it is usually more expensive to purchase efficient equipment than to keep older equipment operating. Nigeria's National Renewable Energy and Energy Efficiency Action Plan looked at a 40% energy efficiency target for the country, equivalent to around 2.5% improvement per year. This leads to a reduction in energy demand as shown in Figure 3 below.

Figure 3: Energy demand – business as usual versus efficient green scenarios



By abandoning the grid-paradigm and investing in the provision of energy for poor communities, the development potential of two thirds of Nigerians is unleashed. At present, poor Nigerians pay a significant “poverty penalty” in order to meet their energy needs. They pay proportionately more for energy, spend more time acquiring fuels, and suffer the health impacts from poor fuel quality. This puts a significant brake on development and the empowerment of women in particular. Importantly, reduced dependence on fossil resources can also increase security. A further benefit of rural electrification on- and off-grid using renewable solutions is that many small entrepreneurs can find work in the sector. Several projects and studies are under way in the area of pay-as-you-go and leasing contracts with small down payments, as well as micro-finance options for SME entrepreneurs.

Renewable electricity generation is a financially attractive option in Nigeria. This is particularly true for those households that are not connected to the national electricity grid. Analysis shows that renewable energy presents a significant saving over diesel generators.^{ix}

The use of more efficient gas power stations, small-scale stations near a source of gas, or replacing existing diesel generation with natural gas, is also attractive, especially so when a station is refurbished, as the cost of the alternative is higher.^x

Savings could also be made by reducing losses from the electricity transmission network.

Finally, the removal of consumer and producer subsidies for fossil fuels can help stabilize government budgets. While intended to reduce the cost of living for the poor, these subsidies have ended up mostly benefiting the rich.

4.2.4 Transport and Infrastructure

The current state of infrastructure in the country is inadequate. The road system is overburdened and poorly maintained. The fast-growing economy has brought many more cars on the road, traveling more miles. Past attempts to improve infrastructure seem to have failed due to policy inconsistency, poor maintenance and poor accountability. Recently, significant new investments in rail transport have been initiated.

Many of the mitigation options can be summarized as “modal shift” – moving passengers or freight from one form or mode of transport to another, less polluting, one. Air pollution in major urban areas is severe and the health benefits of these measures immediate. For example, when High Speed Rail (HSR) is available in Nigeria, a shift from air travel to HSR could begin. Significant investments are being made to revive rail transport, which also has the potential to carry a share of the fast-growing cargo load. With the early stage status of the high speed rail network in Nigeria, it is not possible to quantify the costs and potential accurately.

Measures to increase the efficiency of existing vehicles and the transport system are also possible. Improvements in urban transit systems are difficult to quantify. The price of travel can be adjusted to make it more reflective of the true cost. Initiatives to deliver this aim include road pricing and reform of subsidies.

In addition to improved maintenance and a modal shift for cargo, the most direct benefits would be seen from the introduction of fuel efficiency standards and the use of LPG / CNG for buses and taxis.

4.2.5 Manufacturing

Diversification of the economy is a priority for the government of Nigeria. Over 90% of Nigerian businesses are micro- and small enterprises. Their success is key to alleviating the high unemployment, especially prevalent among youth in rural areas. Enabling entrepreneurs to thrive, especially in smaller towns requires investment in basic infrastructure.

Industrial productivity, in general, has been most significantly impacted by unreliable electricity supply. Nigerian companies also face stiff low-cost competition from consumer goods produced elsewhere. The regulatory environment can be tough to navigate. Domestic demand, however, is growing steadily and has driven significant new investment in key manufacturing sectors.

As Nigeria develops economically, emissions from its industry can be expected to grow significantly. This economic development is welcome and will bring benefits for all Nigerians. At present, the majority of emissions in the sector are from the cement and oil and gas industry. In the future other industries might contribute a greater proportion than today. In the absence of an efficiency mind-set and lack of efficiency benchmarks or standards this might lead to exponential emissions growth in the sector. The use of best available technology at the time of construction of a new industrial facility will reduce future fuel demands and

emissions. In addition, in most cases the use of best practice technology will lead to lower lifetime costs for the businesses involved. The issue can be upfront capital – ability to pay a possibly higher initial cost for the best available equipment, even if this would be recouped over time with lower running costs. Well-functioning financial markets are essential for this – consideration could also be given to some form of industrial development “soft” loans, repayable as the equipment is used.

4.2.6 Short-lived pollutants and air quality

Poor air quality is the bane of urban residents and a health threat. Drastic measures to reduce soot (black carbon) pollution from cars and trucks, small generators and industry are needed. Failure to do so could make Nigeria’s mega-cities unliveable. This includes enforcement of the importation ban of cars over 15 years’ old, stricter inspections, and further consideration of setting efficiency standards for new cars similar to those in South Korea.

Those who rely on fuel wood and charcoal for cooking and heating, primarily women, are exposed to serious indoor air pollution. Providing affordable clean alternatives is the only way forward.

Other short-lived pollutants with a high global warming impact, such as industrial gasses, are not produced in Nigeria. Here the adoption of standards for imported equipment will be considered, in particular in the field of refrigeration and air conditioning where there is a risk of dumping of HCFC and HFC installations that are being phased out in OECD countries. Methane emissions are discussed in the section on gas flaring.

4.2.7 Climate smart cities

Lagos, Kano and Abuja are among the fastest growing cities globally. Keeping them liveable is a major challenge. Providing basic infrastructure, like potable water, waste and sewerage services, affordable housing, electricity, roads and transit services puts a strain on government at all levels. There is, however, a growing movement to improve urban livelihoods through integrated planning focusing on creating workable communities that are affordable to lower middle income families. This requires innovative financial products catering to families underserved by banks.

Lagos in particular is already strongly impacted by flooding. The government is investing to make the city more resilient to climate change. Reducing the environmental footprint of mega-cities will, for example, require promulgating new housing standards. The transit system, building on lessons learned from the introduction of BRT, needs maintenance and investment. Highway expansion may be financed through tolls. Waste management systems are strained, improvements in this area have immediate benefits for health and quality of life.^{xi}

4.2.8 Gender impacts and Social inclusion

The degree to which people are affected by climate change impacts is influenced by their social status, gender, wealth, political power and access to and control over resources. Women and youth, but also remote communities, still have less economic, political and legal clout than, for example, men and the urban middle class. They are more directly impacted and less able to cope with climate impacts. At the same time, mitigation measures can empower these groups that are socio-economically disadvantaged in a differentiated manner. An example is the poverty penalty paid by households in search of potable water and fuel wood. Women benefit most from clean efficient cook stoves, gaining in health and in productive time where these are introduced. They, however, have difficulty accessing financial institutions. Similarly, agricultural extension services have proven to reach more men than women. New policies and measures need to be assessed against their ability to bring social inclusion and be culturally appropriate, as well as improve livelihood security, increase resilience and reduce emissions. The measures included in the Nigeria INDC were deemed to at a minimum be gender neutral and / or to enhance social inclusion.

5 Methodology and Information to facilitate clarity, transparency and understanding

5.1 Transparency

The Lima Call to Climate Action suggested a **list of information** that countries can include in INDCs to ensure transparency and understanding. Nigeria is fully committed to increasing transparency. This INDC contains key data that may enable independent assessment of ambition and compatibility through full transparency. At present, Nigeria does not have a full GHG inventory and accompanying MRV system. We are committed to developing one with support from international partners. The LEAP model and government data that have informed the INDC will be made publicly available. Key aspects of the approach are:

- timeframe base period data 2010-2014, projections 2015 - 2030
- scope of gases CO₂, CH₄ & N₂O (other gases assumed to be negligible)
- sectors IPCC guidelines and definitions were used for all sectors

6 Fairness and ambition

Parties have been requested to show “how the Party considers that its intended nationally determined contribution is fair and ambitious, in light of its national circumstances, and how it contributes towards achieving the objective of the Convention as set out in its Article 2.” Article 2 of the Framework Convention calls for a stabilization of greenhouse gases in order to avoid dangerous climate change, as well as the need to adapt. Nigeria is a low middle income country with a large, fast growing population. Without ambitious mitigation action, Nigeria’s per capita emissions are projected to grow to 3.4 tonnes CO₂e. Coming from a low development base, emissions from Nigeria’s conditional contribution are expected to stabilize slightly above today’s level of 2 tonnes per capita, once the full package of policies and measures has been implemented with international support. Global per capita emissions need to converge around 2 tonnes per capita by 2050. The Government of Nigeria considers, therefore, that its contribution is in line with its common, but differentiated responsibility and respective capability and makes a fair and ambitious contribution to the global effort to prevent dangerous climate change.

The relevant quantitative and qualitative information to facilitate an assessment by the UN FCCC secretariat and the international community of fairness and ambition is provided below in Table 3.

Table 3: Key data

Information	Value	Source
Historical emissions (1850-2010)	2,564.02 million tonnes (MT)	CAIT database, World Resources Institute
1990 emissions	163.91 MT	Nigeria’s Second National Communication
2000 emissions	214.21 MT	Nigeria’s Second National Communication
2010 emissions	263.0 MT	Energy Commission of Nigeria

Information	Value	Source
Estimated emissions per capita	Current: around 2 tonnes CO ₂ e 2030 BAU: around 3.4 tonnes CO ₂ e 2030 Conditional: around 2 tonnes CO ₂ e	ECN (estimated 2015 emissions), World Bank (population estimate), LEAP scenario
Emissions per US\$ (real) GDP	0.873 kg CO ₂ e (2015) 0.491 kg CO ₂ e (2030)	ECN, Re-based GDP LEAP 2030 ambition scenario
Emissions as % of global total	<1% (2010)	ECN (2010 emissions estimate) and US EPA global estimate
GDP per capita (US\$)	2,950 (2014) 3,964 (2030; real 2015 US\$)	Re-based GDP LEAP 2030 BAU scenario

Nigeria believes a Paris agreement should ensure that the collective mitigation ambition is adequate to keep global temperatures below 1.5 degrees Celsius above pre-industrial levels by the end of the century.

The Nigerian INDC does its fair share towards achieving this long-term goal. The conditional contribution contained in it results in a slight growth in absolute emissions, with emissions peaking towards 2030. Absolute emissions are then anticipated to plateau.

7 INDC Implementation

INDC implementation will fall under the remit of the *Nigeria Climate Change Policy Response and Strategy* (NCCPRS) adopted in 2012, in line with the strategic goal to foster low-carbon, high growth economic development and build a climate resilient society. Implementation will be taken forward by existing governance arrangements under the NCCPRS, with coordination being managed by the Department of Climate Change. The appropriate line ministries and agencies will carry out specific implementation activities.

The implementation of the full contribution is conditional on the availability of adequate financing for investment in the mitigation actions contained therein. The INDC can provide public and private sector investors with a road map for Nigeria's development. Nigeria welcomes support for mitigation policies and measures in the form of direct investments and loans. Finance and investment can come from both public and private sources, including the Green Climate Fund and international financial institutions, such as the World Bank, IFC and AfDB. The international bilateral sources should include reliable, new and additional ODA. Contingent on agreement in Paris, it may also include financing through carbon market mechanisms.

International finance and investment, technology and capacity-building will be needed to achieve the ambitious intended contribution. Further work is needed to determine the exact domestic share of the full contribution, as well as the total investment required. We will seek to specify the technical support and capacity building needs in support of the achievement of the policies and measure as soon as possible. To this end, a strategic plan to guide INDC implementation shall be developed. The aim of this plan would be to improve cross-sectoral coordination and policy coherence, as well as enforcement of existing measures. In the

course of a review of legislative and regulatory changes required, the legislature will be consulted.

Specific activities to be carried out in the INDC implementation will include:

- Review of mitigation potential identified in INDC preparation against the *Strategic Framework for Voluntary Nationally Appropriate Mitigation Action*). This framework was intended to enable Nigeria to develop strategic, long-term, participatory, transformational measures and comprehensive programs in driving towards a low carbon climate resilient and pro-growth and gender sensitive and sustainable development path. Implementation of the INDC crucially depends on international support for policies and measures through the NAMA framework.
- Review of Nigeria's current climate finance landscape, support needs and the international funding landscape, along with an assessment of climate finance readiness and gaps. This will include possible use of funding through carbon market mechanisms subject to the detailed provisions of the Paris agreement.
Gap analysis of existing data sharing and reporting structures and processes and make initial recommendations on the appropriate form and structure of a national MRV system, including completing and maintaining the national GHG inventory and assuring data quality.
- Promoting public awareness and education on climate-compatible development.
- Training and capacity building, including simplified user-friendly tools for analysis and further development of the LEAP model.

Annex 1 NASPA Sectoral strategies

A. STRATEGIES FOR AGRICULTURE (CROPS AND LIVESTOCK)

1. Adopt improved agricultural systems for both crops and livestock (for example, diversify livestock and improve range management; increase access to drought resistant crops and livestock feeds; adopt better soil management practices; and provide early warning/meteorological forecasts and related information).
2. Implement strategies for improved resource management (for example, increase use of irrigation systems that use low amounts of water; increase rainwater & sustainable ground water harvesting for use in agriculture; increase planting of native vegetation cover & promotion of re-greening efforts; and intensify crop and livestock production in place of slash and burn).
3. Focus on agricultural impacts in the savanna zones, particularly the Sahel, the areas that are likely to be most affected by the impacts of climate change.

B. STRATEGIES FOR FRESHWATER RESOURCES, COASTAL WATER RESOURCES AND FISHERIES

1. Initiate a national programme for integrated water resource management at the watershed level
2. Intensify programmes to survey water quality and quantity for both ground and surface water
3. Implement programmes to sustainably extend and improve water supply and water management infrastructure
4. Explore water efficiency and management of water demand, particularly in Sahel and Sudan savanna areas
5. Enhance artisanal fisheries and encourage sustainable aquaculture as adaptation options for fishing communities.

C. STRATEGIES FOR FORESTS

1. Strengthen the implementation of the national Community-Based Forest Resources Management Programme.
2. Support review and implementation of the National Forest Policy.
3. Develop and maintain a frequent forest inventory system to facilitate monitoring of forest status; and initiate a research programme on a range of climate change-related topics, including long term impacts of climatic shifts on closed forests.
4. Provide extension services to CSOs, communities and the private sector to help establish and
5. restore community and private natural forests, plantations and nurseries.
6. Improve management of forest reserves and enforce low impact logging practice.

D. STRATEGIES FOR BIODIVERSITY

1. Support the active implementation of the National Biodiversity Strategy and Action Plan (NBSAP), particularly those strategic actions that address climate change impacts.
2. Support recommended climate change adaptation policies and programmes in sectors that affect biodiversity conservation, including agriculture, forestry, energy and livelihoods.
3. Support and implement programmes for alternative livelihoods in order to reduce unsustainable resource use that contributes to loss of biodiversity (see Sector/Theme 11. Livelihoods).

E. STRATEGIES FOR HEALTH AND SANITATION

<ol style="list-style-type: none"> 1. Undertake research to better understand the health impacts of climate change in Nigeria. 2. Strengthen disease prevention and treatment for those diseases expected to increase as a result of climate change. 3. Reinforce programmes to build and maintain wastewater and solid waste management facilities. 4. Promote and facilitate the adoption of practices and technologies that reduce exposure and health impacts from extreme heat. 5. Establish early warning and health surveillance programmes.
F. STRATEGIES FOR HUMAN SETTLEMENTS AND HOUSING
<ol style="list-style-type: none"> 1. Develop climate change adaptation action plans for urban areas, particularly those at greatest risk. 2. Assist communities to reduce vulnerability through participatory planning of land use & housing. 3. Discourage building/urban encroachment into vulnerable areas, high risk zones & low lying areas. 4. Discourage housing and settlement practices that are maladaptive in the face of climate change. 5. Strengthen rural settlements in order to reduce migration.
G. STRATEGIES FOR ENERGY
<ol style="list-style-type: none"> 1. Include increased protective margins in construction and placement of energy infrastructure (i.e. higher standards and specifications). 2. Undertake risk assessment & risk reduction measures to increase resilience of the energy sector. 3. Strengthen existing energy infrastructure, in part through early efforts to identify and implement all possible 'no regrets' actions. 4. Develop and diversify secure energy backup systems to ensure both civil society and security forces have access to emergency energy supply. 5. Expand sustainable energy sources and decentralize transmission in order to reduce vulnerability of energy infrastructure to climate impacts.
H. STRATEGIES FOR TRANSPORTATION AND COMMUNICATIONS
<ol style="list-style-type: none"> 1. Include increased protective margins in construction and placement of transportation and communications infrastructure (i.e. higher standards and specifications). 2. Undertake risk assessment and risk reduction measures to increase the resilience of the transportation and communication sectors. 3. Strengthen existing transportation and communications infrastructure, in part through early efforts to identify and implement all possible 'no regrets' actions. 4. Develop and diversify secure communication backup systems to ensure both civil society and security forces have access to emergency communication methods.
I. STRATEGIES FOR INDUSTRY AND COMMERCE
<ol style="list-style-type: none"> 1. Increase knowledge and awareness of climate change risks and opportunities 2. Undertake and implement risk assessments and risk reduction measures 3. Incorporate climate change into ongoing business planning 4. Review and enforce land use plans in industrial areas in light of climate change 5. Encourage relocation of high risk industries, facilities and markets 6. Promote and market emerging opportunities from climate change 7. Encourage informal savings and insurance schemes, and arrange for the availability of medium term credit (especially for industries in crisis).
J. STRATEGIES FOR DISASTER, MIGRATION AND SECURITY
<ol style="list-style-type: none"> 1. Strengthen capacity to anticipate disasters and impacts on internal migration and security 2. Strengthen capacity to respond through information and awareness, training,

<p>equipment, plans and scenarios, and communication</p> <ol style="list-style-type: none"> 3. Strengthen individual and community-based emergency preparedness and response capacity in high risk areas 4. Strengthen rural infrastructure and the availability of jobs to discourage out-migration.
<p>K. STRATEGIES FOR LIVELIHOODS</p>
<ol style="list-style-type: none"> 1. Develop a replicable approach/model that uses intermediate NGOs, community members and radio to diffuse climate change adaptation approaches and information and to gather feedback on adaptation actions focused on livelihoods. 2. Build a network of intermediate NGOs capable of working on climate change and livelihoods issues, where these NGOs support a number of communities in high risk states. 3. Animate communities with appropriate engagement methods, in order to elicit and document valid climate change and livelihood related needs/vulnerabilities. 4. Use or reinforce available (endogenous) community resources to reduce vulnerability and build livelihood-linked capacity to adapt to climate change. 5. Encourage community participation and active roles by both genders in all livelihood development initiatives.
<p>L. STRATEGIES FOR VULNERABLE GROUPS</p>
<ol style="list-style-type: none"> 1. Create awareness among government staff, including disaster and emergency management personnel, about climate change impacts and how these impacts affect vulnerable groups. 2. Provide basic training for government staff on gender awareness tools to enhance implementation capacities. 3. Adapt government programmes, including emergency response plans and programmes directed at vulnerable groups, to better address the impacts of climate change on these groups. 4. Adapt public service facilities, including school buildings, to withstand storms and excess heat. 5. Intensify immunization of children and youth to provide protection against diseases that are expected to become more prevalent with climate change. 6. Retrain health workers to appreciate emerging climate change challenges within the context of immunization delivery and other comprehensive healthcare delivery. 7. Encourage faith-based and civil society organizations to provide social welfare programmes and other support to address the climate change-induced needs of vulnerable groups. 8. Adapt to our national, the World Meteorological Organization- Global Framework for Climate Services (WMO-GFCS) to Nigeria's needs (National Framework for Application of Climate Services - NFACS) to reduce vulnerability of communities through enhanced advocacy and implementation of the five Pillars of the Framework.
<p>M. STRATEGIES FOR EDUCATION</p>
<ol style="list-style-type: none"> 1. Provide evidence-based information to raise awareness and trigger climate change adaptation actions that will protect present and future generations in Nigeria. 2. Develop skills-based curriculum in subjects like science, geography, social studies, language arts, environmental education and technology that will empower children to better respond to the threats of climate change. 3. Train teachers on climate change adaptation teaching strategies and techniques at pre-primary, primary, secondary and tertiary levels of education in Nigeria.

ⁱ Pew Research Center, spring 2015 Global Attitudes survey report Q13a-g.

ⁱⁱ See e.g. HBS, 2010; Abiodun, et al., 2011; Cervigni et al., 2013, Hassan et al., 2013; Oladipo 2013 a&b

ⁱⁱⁱ Cervigni et al. 2013

^{iv} In 2014, the Nigeria GDP was “rebased” to include a greater number of economic activities (46 compared to 33 previously). This improved coverage (including of the informal sector), the inclusion of new industries. Methodological improvements led to significant increases in the contribution of the services sector, manufacturing, construction, and water & electricity. On the other hand, value added by the agricultural and the oil & gas sectors declined notably relative to GDP.

^v LEAP, the Long-range Energy Alternatives Planning System, is a widely-used software tool for energy policy analysis and climate change mitigation assessment.

^{vi} The emissions reference values were derived from the relevant IPCC guidelines. Cost estimates were mainly drawn from the detailed World Bank study on Low Carbon opportunities in Nigeria, with additional input from the United Nations Environment Program (UNEP) Greenhouse gas Abatement Cost Model (GACMO of 14 August 2015).

^{vii} Source: World Bank

^{viii} Analysis of possible flaring scenarios in Ibitoye (2014)

^{ix} Tariffs for those connected to the network are around 30 Naira per unit (kWh), but the costs per unit of electricity for small diesel generators can be much higher. Analysis shows that solar and wind systems could save roughly US\$0.10/kWh (around 20 Naira per unit) compared to a diesel system, with an abatement cost per tonne of CO₂ of -\$46 (that is, a *saving*).

^x Levelised costs of efficient combined cycle units are usually lower than those for single-cycle units – and much lower than for diesel units - so this option is cost effective even before considering climate benefits. A policy of requiring all new power stations to use internationally best available combined-cycle units would be quite significant. The estimated benefit is US\$15 per tonne of CO₂ saved, with annual savings of 20 million tonnes.

^{xi} In the absence of comprehensive data the emissions reductions cannot be quantified.