InfraCredit
Securing Infrastructure Finance

CLEAN ENERGY TRANSITION STRATEGY AND ROADMAP

2022 – 2040

Acronym and Abbreviation

Acronyms and Abbreviations

BEEC	Building Energy Efficiency Code
BOOT	Build Own Operate Transfer
CCGT	Combined-cycle gas turbine
CCS	Carbon capture and storage
EE	Energy efficiency
EEI	Energising Economies Initiative
ESG	Environmental, Social, and Corporate Governance
EV	Electric Vehicles
LPG	Liquefied Petroleum Gas
MSME	Micro, small, and medium-sized enterprises
MT	Metric ton
NASPA	National Adaptation Strategy and Plan of Action
NBS	National Bureau of Statistics
NDC	Nationally Determined Contributions
NEP	Nigeria Electrification Project
NERC	Nigerian Electricity Regulatory Commission
NESP	Nigerian Energy Support Programme
NGEP	National Gas Expansion Programme
NGV	Natural Gas Vehicles
NLNG	Nigeria LNG
NNPC	Nigerian National Petroleum Corporation
ODA	Official Development Assistance
PIDG	Private Infrastructure Development Group
PPA	Power purchase agreement
PPI	Presidential Power Initiative
PPP	Public-Private Partnership
PV	Photovoltaic
RE	Renewable energy
REA	Rural Electrification Agency
REF	Rural Electrification Fund
RESIP	Rural Electrification Strategy and Implementation Plan
SHS	Solar home systems

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Introduction

InfraCredit is a 'AAA' rated specialised financial guarantor, sponsored and backed by the Nigeria Sovereign Investment Authority, GuarantCo, KfW Development Bank, Africa Finance Corporation, African Development Bank and InfraCo Africa, with a mandate to act as a catalyst and deepen the domestic debt capital markets for infrastructure finance in Nigeria. We are committed to unlocking long-term infrastructure financing in Nigeria by providing local currency guarantees to enhance the issuance of corporate infrastructure debt instruments. InfraCredit acts as catalyst to attract the investment interest from pension funds, insurance firms and other long-term investors thereby deepening the Nigerian debt capital markets. We aim to bridge this market gap and successfully unlock the potential for long term local currency infrastructure finance in Nigeria.

InfraCredit Clean Energy Transition Strategy and Roadmap (CETSR) underscores the strategic priorities of InfraCredit's climate action. The urgency of tackling climate change has reached unprecedented scale given the recent waves of climate hazards happening around the world. The Covid-19 pandemic has further revealed the fragility of our systems and the vulnerability of millions of people to catastrophic impacts of climate change. The options are clear: we either respond to avert the imminent climate crisis or deal with the costly economic, social and ecological aftermaths.

The Intergovernmental Panel on Climate Change (IPCC) Six Assessment Report 2022 observes

that Africa is already experiencing adverse impacts of climate change, affecting water resources, food security, health and wellbeing, and cities, settlements and infrastructure. Taking action to reduce climate exposure, mitigate vulnerability and enhance social-ecological resilience is an obligation that businesses and governments must embrace to sustain our collective wellbeing and planetary health.

InfraCredit recognises that climate change poses risks to economic and social infrastructures, with attendant impacts on social and economic systems. By unlocking finance for the development of low carbon and climate resilient infrastructure in Nigeria, we are committed to reducing greenhouse emissions (GHG) through investments in projects that align with the 2050 Net Zero target. The overarching goal of InfraCredit Clean Energy Transition Strategy is to mobilise catalytic finance to scale the development of carbon-neutral and climate resilient infrastructure to accelerate the achievement of positive development outcomes.

In line with our investment philosophy, the sustainable development goals (SDGs), and the Paris Accord goal of limiting temperature increases to only 1.5 degrees Celsius (2.7 degrees Fahrenheit) above pre-industrial era levels, InfraCredit is mainstreaming climate action into our business through the following key actions:

- Assessing resource efficiency of projects against requirements of applicable IFC Performance Standards (2012) as part of environmental and social due diligence process (ESDD);
- Driving the adoption of climate transition policy within our portfolio and building their capacity to measure, track and mitigate GHG emissions;
- Implementing a 10 to 20-year roadmap that supports a strategic transition across targeted areas of opportunity. This incorporates a transitional approach to clean/ renewable energy over the long term, which aims to optimally support energy sources that act as a cleaner alternative for a limited period, on the course to reach the commitment to net zero emissions by 2050 as outlined in the Paris Agreement;
- Assessing climate-resilience of investments we guarantee through a set of sector-specific climate decision trees;
- Mobilise blended finance to accelerate investments in clean energy and renewable energy projects; and
- As part of our Development Impact Theory of Change, incorporating and tracking climate change indicators across our transaction cycle.

The Private Infrastructure Development Group (PIDG) is committed to the transition towards net zero emissions by 2050 and takes climate change into account in every investment and operation decision. As a PIDG investee[1], InfraCredit is also committed to this transition and has conducted a strategic assessment of how its portfolio can become more aligned to the Paris Agreement. Under its technical assistance programme[2], PIDG engaged Economic Consulting Associates (ECA) to support InfraCredit in the development of their CETSR. This Strategy and Transition Roadmap takes into consideration Nigeria's commitments under the Paris Agreement, the policies of the sectors in which InfraCredit operates, and PIDG's climate change approach. This document is an abridged version of the main document which discusses policy and regulatory context and provides an extensive analysis of sector-specific investment opportunities in Nigeria.

1 GuarantCo and InfraCo Africa are PIDG companies with investment in InfraCredit.

2 KfW provided useful contributions to the concept paper that guided the research for and preparation of the CETSR.

Nigeria has traditionally presented a challenging environment for private sector clean energy finance. This has been heightened in more recently due to the impacts of the Covid-19 pandemic. The lack of liquidity in the banking sector means long-tenor, local-currency debt needed for financing clean energy projects is difficult to access and commercial terms are prohibitive. Nigeria's parallel formal and informal exchange rates system have further slowed clean energy financing, by reducing foreign investment and increasing the cost of imported equipment. To address these market inefficiencies and critical financing gaps, the establishment of a specialised entity, such as InfraCredit, to unlock local financing opportunities and accelerate climate-smart infrastructure development is of great importance to achieving the Nationally Determined Contributions (NDCs).

Nigeria's plans to meet its NDCs are based mainly on a transition to cleaner and more efficient use of energy. The key mitigation measures identified are demand-side energy efficiency, efficient gas- fired power stations, reductions in gas flaring, increasing renewable energy (RE), and a reduction in electricity transmission and distribution losses. The country's original NDC submission in 2015 estimated the cost of implementation at $142 billion by 2030.

Nigeria's updated 2021 NDC submission to United Nations secretariat estimated investment required to deliver the conditional target as $177 billion over the implementation period of 2021-2030. As a priority, the bulk of investments, USD122 billion within the 10-year period, will need to be targeted at the electricity generation sector.

The recently launched Nigeria Energy Transition Plan (ETP) is a home-grown, data-backed, multipronged strategy developed for the achievement of net-zero emissions in terms of the nation's energy consumption. It sets out a timeline and framework for the attainment of emissions' reduction across 5 key sectors: Power, Cooking, Oil and Gas, Transport, and Industry. The financing requirement to implement the ETP is estimated at $1.9 Trillion in order for Nigeira to attains its Net Zero target by 2060, including $410 Billion above projected usual spending. This additional cost translates to about $10 billion annually. such as:

- Nigeria Electrification Project (NEP) – the project promotes the development of private sector mini-grids and solar home systems (SHS) through subsidies. Minimum subsidy tender and performance-based grants for mini-grids, and an output-based fund and market scale-up challenge fund for SHS suppliers. The current funding for the subsidy component, provided by the World Bank and the African Development Bank (AfDB), amounts to about $250 million. This amount will need to be matched by the private sector, with debt required to play a substantial role.
- Energising Economies Initiative (EEI) – the initiative aims to support the rapid deployment of off-grid electricity solutions to MSMEs in economic clusters (such as markets, shopping complexes and agricultural/industrial clusters), through private sector developers. 340 economic clusters have already been identified across the country. The total estimated energy demand from these clusters is 3-4GW.
- Solar Power Naija was launched in late 2020 with the objective to achieve 5 million new solar-based connections in communities that are not grid connected. The programme will provide long-term low-interest credit facilities to the NEP pre-qualified SHS value chain players that include

manufacturers and assemblers of solar components and off-grid energy retailers in the country.

- Several regulations issued by the Nigerian Electricity Regulatory Commission (NERC),
- such as captive power generation, eligible customers, embedded generation, mini- grid regulations, Independent Electricity Distribution Network (IEDN), and franchising guidelines.

Availability and challenges of clean energy finance

Macroeconomic overview

Businesses consider liquidity and foreign exchange volatility to be key challenges for capex investment, which requires large amount of financial investment and typically requires foreign currency- denominated contracts. Nigeria's trade deficit, lack of diversity in sources of foreign exchange, and banking policies drive double digit annual inflation and high interest rates. The lack of liquidity in the banking sector means long tenor debt needed for financing clean energy projects is difficult to access commercially in many cases. Furthermore, Nigeria's parallel formal and informal exchange rates system have further slowed clean energy financing, both in reducing foreign investment and increasing the cost of imported equipment. The last year has exacerbated this situation due to the reduction in the demand for oil, the uncertainty of Chinese infrastructure commitments to Nigeria (currently valued at over $20 billion USD[3]), and unemployment leading to political and economic instability nationwide.

Demand and supply of private finance

Many of Nigeria's targeted interventions face challenges in obtaining the required financing to reach emissions reductions ambitions. The power sector in particular faces insufficient supply of finance due in part to the following challenges:

- **Long tenor combined with revenues in local currency** – interventions whose customers pay in Naira lead to a significant demand for local currency financing. Commercial banks and other significant financiers have significant restrictions particularly on long tenor loans due to the risk of currency devaluation. Most commercial loans in Nigeria offer tenors of 1-3 years.
- **Importing equipment** – a significant amount of clean energy capital expenditure is allocated towards importing equipment. The volatility of foreign exchange and difficulty securing it at the appropriate rates can add significantly to the cost of clean energy investments in Nigeria. There are currently investments underway to assemble most of the equipment for solar projects in Nigeria, but currently this market is shallow, and reliability and warranty risks untested to date.
- **High interest rates** – Nigerian commercial banks' lending rates in local currency range between 24-28%. Initiatives with tenors of over 5 years financed at such rates will have financing costs more than triple the size of the original loan principal. This leads to a significant departure of policy ambitions from market feasibility in Nigeria, as the average cost of mitigation for the initiatives in

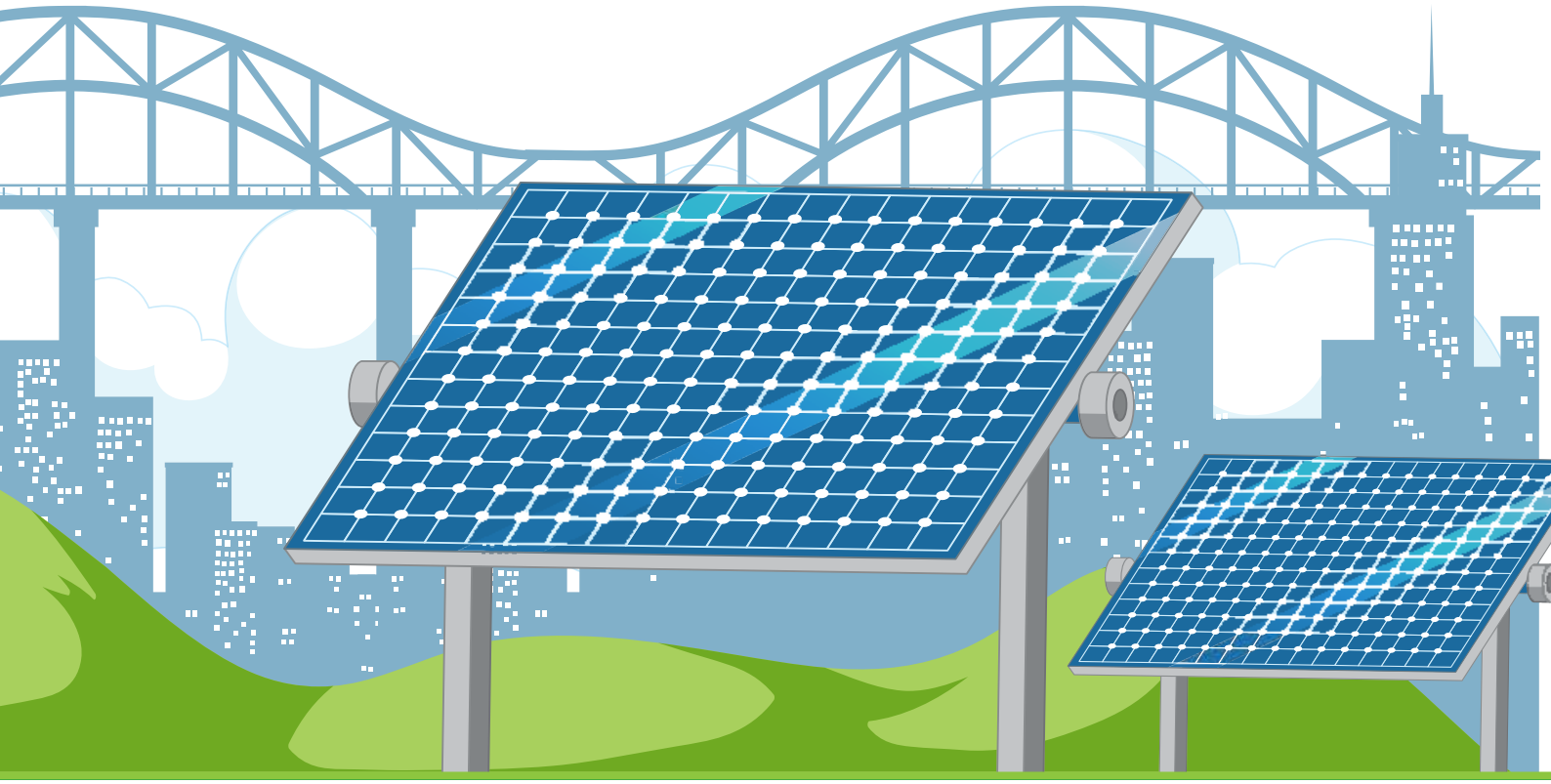
3 https://www.silkroadbriefing.com/news/2020/10/30/eight-african-belt-and-road-initiative-projects-that-global-investors-should-be- aware-of/

a 2013 World Bank study[4] assumed a discount rate of 10%.

- **Lack of strong balance sheets and consistent profitability from established project developers** – The effect is more severe where payments are dependent on State off-takers or government regulations. For example, on-grid developers have had challenges with instability in both regulations and revenue which has severely impacted bankability prospects of clean energy projects. Off-grid developers often lack strong balance sheets, particularly in the mini-grid space despite significant incentives provided by the World Bank via the Rural Electrification Agency.

The commercial and industrial off-grid space is starting to attract significant amounts of capital and demonstrate profitability, yet local financing institutions remain hesitant to lend[5].

Due to the above challenges in local debt and the shallow pool of equity available to scale, there is an opportunity for blended finance to address risks and be leveraged to significantly increase the supply of finance for clean energy projects. These types of finance may also be relevant for financing Nigeria's updated NDC targets in clean cooking, water infrastructure, and forestry.



4 Cervigni, Raffaello; Rogers, John Allen; Henrion, Max. 2013. Low-Carbon Development : Opportunities for Nigeria. Direction in Development--Countries and Regions;. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/15812.

5 The African Development bank (2020). Exploring the role of guarantee products in supporting local currency financing of sustainable off-grid energy projects in Africa.

InfraCredit Clean Energy Transition Strategy

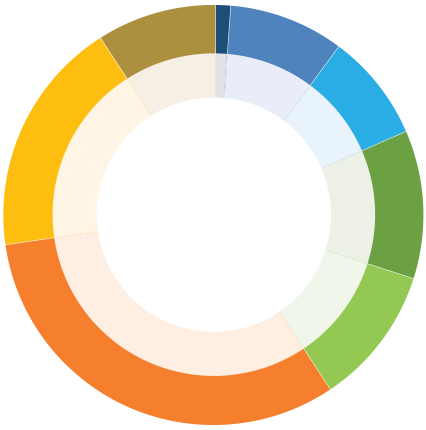
InfraCredit is in a unique position to influence Nigeria's energy transition response by providing local currency credit guarantees to enhance the quality of debt instruments issued to finance infrastructure projects in Nigeria. Key investment markets include infrastructure projects associated with energy supply and distribution infrastructure (except oil), waste management infrastructure, transportation, telecommunications/ICT, urban infrastructure (housing, hospitals, education), and agricultural infrastructure.

Existing portfolio of investments

InfraCredit, through its guarantees, facilitated first-time access to local currency finance for eight (8) infrastructure companies. The aggregate portfolio size of guarantees issued by InfraCredit as of 30 Sept. 2022 is NGN113.39 billion with an amortized value of NGN110.15 billion (principal amount outstanding), composed of four energy projects, two transportation projects, one inputs to infrastructure project and one ICT/Telecom project. The weighted average tenor of guaranteed debt (principal) is 12.51 years.

Sector Split

Captive Power	**22%**
Transportation & Logistics	**29%**
Embedded Power	**08%**
Input to Infrastructure	**32%**
ICT / Telecoms	**09%**



Portfolio size (NGN' billion)

Viathan	**01%**
NSP	**09%**
GEL	**08%**
TSL	**12%**
LFZC	**11%**
GPC	**32%**
PAT	**18%**
ASIKO	**09%**

VIATHAN GROUP	ISSUER	VIATHAN FUNDING PLC
Viathan Group ('Viathan' or 'the Group') develops and operates captive and embedded (off-grid) power solutions for governmental, commercial and residential off-takers across Nigeria. In 2017, Viathan raised N10 billion via senior guaranteed fixed rate bonds, the first corporate infrastructure bond issued in the Nigerian debt capital markets. The bond proceeds was utilized to expand its generation capacity by 7.5 MW, construct a 104,800 scm/day Compressed Natural Gas (CNG) Plant and refinance short term bank debts. The company also raised N1.53billion guaranteed Bank of Industry (BOI) credit facility in August 2021 to finance expansion requirement for additional power connection to end users.	**Issue Date**	15th December 2017
	Sector	**Off grid power** Power generation & Compressed Natural Gas (CNG) production.
	Tenor	Bond: 10 years, BOI: 6 years
	Location of Operation	South-West Nigeria
	Asset Size/ Capacity	CNG Plant capacity – 104,800 SCM per day and 31,754,400 SCM per year. Power Generating Capacity: 52MW
	Issue/Bond Rating	June 2019
	Long-term	AAA(NG) (Agusto & Co. and GCR)

NORTH SOUTH POWER COMPANY LIMITED	ISSUER	NSP-SPV POWERCORP PLC
North South Power Company Limited ('NSP' or 'the Company') was established in 2012 to own and operate a diverse and growing portfolio of electricity generation businesses across Africa. The company is the operator of a 30- year concession right for 600MW Shiroro Hydro power plant in Niger State and 25-year concession 30MW Gurara Hydro power plant in Kaduna State. In 2019, NSP issued the first certified corporate green bond and the longest tenored corporate bond in the Nigerian debt capital markets approved by SEC. The bond proceeds was utilized to fund the overhaul of a 150MW hydropower turbine and refinance short term bank debts. NSP also raised N1.36billion guaranteed Bank of Industry (BOI) credit facility in May 2021 to support rehabilitation of its power plant and expansion of distribution infrastructure	**Issue Date**	27th February 2019
	Sector	On-grid hydro power
	Tenor	Bond: 15 years, BOI: 6 years
	Location of Operation	North-Central Nigeria
	Asset Size/ Capacity	The Power plant has an installed capacity of 600MW from 4 generating units rated at 150MW each.
	Issue/Bond Rating	June 2019
	Long-term	AAA(NG) (Agusto & Co. and GCR)

GEL UTILITY LIMITED	ISSUER	NSP-SPV POWERCORP PLC
GEL Utility Limited (''GEL'') develops and operates grid-connected or off-grid electric power in Nigeria and is the operator of an 84MW power plant which provides captive off grid electric power to the Port Harcourt refinery under a 20-year power purchase agreement with the NNPC. In 2019, GEL issued a 15-Year series 1 senior guaranteed fixed rate bond under a N50 billion debt issuance programme. The GEL Bond is the first corporate infrastructure bond issued in the Nigerian debt capital markets guaranteed by InfraCredit and co-guaranteed by the U.S Agency for International Development ("USAID"). The bond proceeds was utilized to finance capital expenditure for the evacuation of excess power and refinance existing debt.	**Issue Date**	28th August 2019
	Sector	Off-grid Power generation
	Tenor	15 years
	Location of Operation	South –South Nigeria
	Asset Size/ Capacity	Dual Fired Gas Turbines with an installed capacity of 84MW
	Issue/Bond Rating	June 2019
	Long-term	AAA(NG) (Agusto & Co. and GCR)

TRANSPORT SERVICES LIMITED	ISSUER	TSL SPV PLC
Transport Services Limited (''TSL'') is a leading fully integrated transport and logistics company that delivers value added logistics and distribution services to a wide range of corporate & retail clientele in industries such as agro-processing, FMCG, oil & gas, cement, amongst others under fixed term contracts. TSL operates a fleet of over 840 vehicles covering 40 approved inter-state routes across multiple locations in Nigeria. In September 2020, TSL issued a N12 billion 10-year series 1 corporate bond under its N50 billion bond issuance programme. The bond proceeds was utilized to refinance its short-term loans to matching long term fixed rate debt that will sustainably support TSL's consistent business growth and expansion plans.	**Issue Date**	6th October 2020
	Sector	Transportation
	Tenor	10 years
	Location of Operation	States across Nigeria
	Asset Size/ Capacity	Over 840 Trucks
	Issue/Bond Rating	Mar 2020
	Long-term	AAA(NG) (Agusto & Co. and GCR)

LAGOS FREE ZONE COMPANY	ISSUER	LFZC FUNDING SPV PLC
The Lagos Free Zone Company ("LFZC"") is a free trade zone developer and management company responsible for the Lagos Free Zone, a 830 hectares Industrial and Logistics Zone with state-of-the-art facilities including roads, piped gas supply network, treated water supply network, street lighting and a water drainage network, located at Ibeju Lekki, Lagos, expected to significantly contribute to Nigeria's economic development. The LFZC Bond is the first 20-year corporate infrastructure bond issued in the Nigerian debt capital markets and guaranteed by InfraCredit. The bond proceeds will be used to partially repay LFZC's existing shareholders' advances, which will be re-deployed into further development of the Free Zone (i.e., dedicated power plant, further land clearing and development, roads, commercial office tower to host shipping lines, etc.).	**Issue Date**	Series I: 16th September 2021 Series II: 10th May 2022
	Sector	Inputs to Infrastructure
	Tenor	20 years
	Location of Operation	South – West Nigeria
	Asset Size/ Capacity	830 hectares of Land
	Issue/Bond Rating	Aug 2021
	Long-term	AAA(NG) (Agusto & Co. and GCR)

PAN AFRICAN TOWERS	ISSUER	PAT DIGITAL INFRA FUND SPV PLC
Pan African Towers Limited ("PAT") is an independent owner and operator of digital infrastructure and wireless communications sites in Nigeria. The Company commenced business operations in Nigeria, in 2017 and currently has c.1,000 towers across Nigeria, with over 600 active towers. The Company has historically invested in digital infrastructure assets, with a predominant focus on the acquisition of mobile telecommunications/broadcast towers. In February 2022, PAT issued a N10 billion 10-year Series 1 corporate bond under its N50 billion bond issuance programme. The PAT Bond is InfraCredit's first guaranteed bond issuance in the ICT/Telecommunications sector. The bond proceeds will be used to fund development of new sites, reduce carbon footprint by swapping out diesel generators with renewable power, and to fund working capital requirement.	**Issue Date**	2nd February 2022
	Sector	ICT/ Telecommunication
	Tenor	10 years
	Location of Operation	States across Nigeria
	Asset Size/ Capacity	c. 1000 Telecom Towers
	Issue/Bond Rating	Sept 2021
	Long-term	AAA(NG) (Agusto & Co. and GCR)

GPC	ISSUER	GPC SPV PLC
GPC Energy and Logistics Limited ("GPC") is one of the leading transportation/ logistics companies in Nigeria with operations in 12 major locations across the South-West, South-South, South-East, and North Central regions. The Company operates a fleet of 560 vehicles for its logistics operations, supporting blue-chip companies operating in breweries, fast-moving consumer goods (FMCG), food & beverage and cement industries. In November 2021, GPC issued a N20 billion 10-year Series 1 corporate bond under its N50 billion bond issuance programme. The bond proceeds was utilized to refinance GPC's existing short-term debt with a longer tenor debt that better matches the assets' life; and finance the acquisition of new fleet of trucks comprising 220 vehicles.	**Issue Date**	23rd November 2021
	Sector	Transport & Logistics
	Tenor	10 years
	Location of Operation	South-West, South-South, South-East, and North Central regions, Nigeria
	Asset Size/ Capacity	560 Vehicles
	Issue/Bond Rating	Sept 2021
	Long-term	AAA(NG) (Agusto & Co. and GCR)

ASIKO POWER LIMITED	ISSUER	ASIKO POWER INFRA FUND SPV PLC
Asiko Power Limited (Asiko) provides Gas-to-Power ("GTP") solutions for captive power generation. Currently, the company has power production capacity of 5.5MVA which is generated and distributed via five (5) units of 1000 KVA gas-fired generators and several 100KVAs, 67 KVA and 37.5 KVA generators. The sponsor also trades and distributes Propane for household, commercial and industrial use. It operates an efficient logistics business with fleet of trucks, pick up vans and other vehicles, through which it delivers Gas to its customers. In April 2022, ASIKO issued a NGN1.5billion 7-year Series 1 Senior Guaranteed Fixed Rate Infrastructure Bonds under its N50 billion bond issuance programme. The bonds proceed is to finance capital expenditure that relate to the expansion of the company's power production capacity to power 14 additional Union bank branches and operationalization of 8 additional outstanding GSPA and PPA for Narth gas limited, Regal-sea View estate, Fat butcher Lagos, Royal Adiela ventures, amongst others.	**Issue Date**	13th April 2022
	Sector	Off grid power
	Tenor	7 years
	Location of Operation	South-West, South-South and South-East, Nigeria
	Asset Size/ Capacity	5.5MVA
	Issue/Bond Rating	Sept 2021
	Long-term	AAA(NG) (Agusto & Co. and GCR)

InfraCredit is pursuing a 10 to 20-year roadmap that supports a strategic transition to a portfolio of investments that is aligned to the Paris Agreement across targeted areas of opportunity. To achieve this, InfraCredit recognises the need to take a transitional approach to clean energy over the long term, meaning that it is necessary to support energy sources that act as a cleaner alternative (such as natural gas) for a limited period, on the course to reach the commitment to net zero emissions by 2050.

The strategy and roadmap covers the following key areas of opportunity:

- Energy supply;
- Transportation; and
- Urban, semi-urban, and rural infrastructure.

The following sections explore the sector-specific transition opportunities.

2.1 Energy supply

2.1.1 Power generation

Energy supply features prominently in the NDCs, with concrete mitigation actions including:

- **Ending gas flaring:** Improved enforcement of gas flaring restrictions. Development of gas-to-power plants at gas flaring sites.
- **13 GW of off-grid solar:** Rural electrification will be driven by solar and other cost- efficient renewable solutions, replacing diesel generators.
- **Installing efficient gas generators:** Multi-cycle power stations for new generation and refurbishment. Small-scale stations near a source of gas. Feeding industrial clusters with centralised gas supply. Replacing existing diesel generation with natural gas.

InfraCredit, through our guarantees, have already facilitated access to local currency finance for these types of investments (off-grid gas-fired power generation and renewables). Today, InfraCredit's pipeline of energy supply and gas investments stands at about $120 million.

Taking into consideration Nigeria's power sector development plans, areas of opportunity for investments aligned with the Paris Agreement include:

Short term:

- **Decentralised power generation:** Electricity demand in Nigeria exceeds centralised generation capacity by an unknown factor and is supplied by diesel and petrol generating sets ranging from 100 W - 10 MW, summing to a decentralised fleet with capacity on the order of at least 10 GW. As the viability of this decentralised fossil fuelled electricity use is already proven, low-carbon substitution at lower cost of diesel-solar hybrid systems and/or replication and scaling of industrial operations based on gas-fired generators is happening spontaneously without the complication of grid reliability and regulatory issues faced by larger power generators. Battery storage systems also play an important role in further displacing diesel back-up generation.
- **Rural electrification:** the Rural Electrification Strategy and Implementation Plan (RESIP) targets increasing access to electricity to 90% by 2030. The total investment opportunity amounts to over $12 billion in the long run, most of which is in Renewable Energy (RE)/ hybrid mini-grids and Solar Home System (SHS). The Nigeria Electrification Project (NEP) promotes the development of private sector mini-grids and SHS through subsidies.

Medium term:

- **Decentralised gas plants near load centres:** Many plans for generation capacity in the medium-term focus on delivering **small (1 - 10MW) gas plants located near load centres and industrial customers,** due to their low capital cost and flexibility. Establishing a set of gas-fired power plants as part of the Nigerian National Petroleum Corporation (NNPC) has already helped ensure substantial generation capacity in Nigeria, and while investments for reliability and improvements in operational practice would reduce transmission constraints, capacity expansion of bulk generation or transmission capacity seem premature.

Long term:

- **Centralised utility-scale solar generation projects:** Consultant studies have identified zones and verified transformation capacity allowing up to **2GW of utility-scale** photovoltaic capacity in the middle and north of Nigeria, which have been explored by project developers in recent years.
- **Enhanced gas utilisation and reduced flaring:** Under stable electricity demand growth scenarios, significant GHG mitigation potential exists in the combined development of **pipelines, flare-gas capture, and further gas**

turbines. Nigeria has developed a detailed roadmap to end routine gas flaring and to leverage the full potential of gas for power generation. Over 130 flare sites have been identified for flaring down projects so far (distributed in the Niger Delta, onshore and offshore). Collecting the flare gas would significantly decrease the fuel import dependency and would substantially contribute to carbon emission reduction as well as reducing public health hazards. Treated flare-gas use (up to 3,300 million standard cubic feet per day) would be enough to power up to 15 GW of baseload high-efficient combined-cycle gas turbine (CCGT) power plants across the country depending on the collected flare gas quality.

2.1.2 Gas

In addition to power generation, gas is expected to play an important role in decarbonising other sectors. Updated NDCs are expected to be aligned with the NGEP, which will promote the domestic use of Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG)[6]:

- Developing modular CNG refilling plants for the distribution of gas as vehicular fuel (further discussed in section 2.2, transportation)
- Supporting conversion from the use of traditional fuels (like kerosene, wood etc.) to the use of cleaner LPG fuel. The government will engage with private sector to promote the distribution and domestic manufacture of cylinders and other accessories to expand the adoption and use of LPG.

The National LPG Expansion Implementation Plan has the target of creating demand for 5 million metric tons of LPG per year by 2027. This demand is primarily to come from homes (2 million tons), agro-processing (1 million tons), automobile and transportation (1 million tons), and productive industries (textiles, tannery, food, and abattoirs; 1 million tons).

The plan estimates an investment requirement of about $2 billion in infrastructure for LPG transport and retail, including 3,000-5,000 LPG filling plants, a fleet of 10,000 trucks, storage facilities, etc.
InfraCredit could play a role in supporting the financing of these investments through existing guarantee mechanisms and funds under development to support smaller ticket sizes. Importantly, blended finance from development finance institutions and donor organisations will play a critical role in catalysing investment opportunities to reach commercially attractive scale.

2.2 Transportation

The Nigeria transport sector is likely to remain a significant source of emissions in the short to medium term. It is likely, as with many other developed countries, that plans to decarbonise the transport sector will lag behind plans to decarbonise the power sector[7].
Transport projects, across a range of sectors, feature as a large part of InfraCredit's current mandated and unmandated pipeline:

- 28% of investments in the mandated pipeline and 15% of investments in the unmandated pipeline are associated with transport projects;

6 Bouncing Back: Nigeria Economic Sustainability Plan, 2020

7 Most plans to decarbonise transport consider electric vehicles (EVs) to be a significant part of the solution. EVs typically rely on a decarbonised or mostly decarbonised power system. Otherwise, the EVs are dependent on a carbon polluting technologies.

- These investments include a total of $133 million for road projects, mainly tolled roads; and
- Additionally, and in line with the Nigerian government's NGEP, InfraCredit recognises the potential for natural gas vehicles as a future source for investment.

Box 1 Medium- to long-term investments to convert traditional fuel pumps to accommodate gas

The Nigerian government has the stated policy intent of significantly increasing the domestic use of LPG, Liquefied Natural Gas (LNG) and CNG. Natural gas vehicles are expected to play a major role in driving domestic demand. Significant work is likely to be required for the retro-fitting of existing stations to accommodate natural gas. Investments will be needed in:

- **Fuel feeder infrastructure/distribution network:** this involves assessing how the fuel will get from well to the petrol pump
- **Storage:** how the fuel will be stored at the petrol pump
- **Dispensing/fuelling bays:** Investments/adaptations required to make the pumps function

Generally, these investments appear needed to meet the infrastructure gap in Nigeria. Secondly, and in most cases, these investments appear to be conditionally aligned with Paris Climate Agreement and Nigeria's NDCs which underpin this strategy.

2.2.1 Road transport

Emissions from roads include directemissions (scope 1, 2)[8], such as those arising from road construction, and vehicle emissions (scope 3). The decarbonisation approach is aligned with approaches taken by other Development Finance Institutions (DFIs).

Future investment in roads and emissions will be driven by:

- **Increased vehicle ownership** as Nigeria develops economically;
- **The quality of roads in Nigeria** – while Nigeria has the second largest road network in Sub-Saharan Africa, approximately 50% of Nigeria road network is currently unpaved; and
- **The prevalence and dominance of road freight transport** as a major driver of the economy – there are few effective alternatives to road freight transport in Nigeria.

Generally, investment in roads[9] is conditionally aligned with the Paris Agreement. This is especially true when we consider the counterfactual of fewer roads but increased vehicle ownership; the counterfactual would indicate greater emissions due to increased acceleration/deceleration and in car waiting times. In all cases improving road quality through road rehabilitation will decrease carbon emissions and therefore should be allowed.

InfraCredit will consider the distributional impact of road sector investments. Journey time reduction analysis would consider:

- **The purpose of the vehicle** (work, commuting, other). The value of time changes significantly based on the type of activity.
- **The type of vehicle**, e.g., car, large goods vehicle (lorries/freight) and public service vehicle (buses).
- **The importance and benefits of the road to non-road users**, particularly towns and communities which are bypassed or connected to services. Bypasses can benefit communities from reduced localised road pollution which is particularly acute in urban areas.

While achieving journey reduction time is a minimum threshold of aligning with the PIDG Climate Change Strategy/Paris Climate Agreement, the additional analysis can help select roads with greater economic benefits.

2.2.2 Vehicles

Natural gas vehicles (NGVs) and EVs investments are considered to be aligned with the Paris Agreement for the following reasons:

- EVs are aligned because of the potential to benefit from a decarbonised power sector. Nigeria's current power sector is not decarbonised, is currently unreliable, and it is not clear if the EVs will be viable with the additional investment to provide grid or off-grid renewable charging in the near- to medium-term (the calculus for EV motorbikes is more attractive than EV cars).

8 'Scope 1' emissions are the direct GHG emissions from the facilities owned or controlled within the physical project boundary. 'Scope 2' emissions are indirect emissions associated with the off-site production of energy used by the project. 'Scope 3' are indirect emissions associated with use of the infrastructure. For example, emissions of vehicles can be considered scope 3 emissions of road projects.

9 This includes logistics businesses with trucks fuelled by diesel, with no commercially viable alternatives, where clients demonstrate commitment and capacity to implement an Energy Transition Plan.

- Natural gas vehicles (LNG and CNG) are carbon-polluting but typically less so than diesel or petrol vehicles.

Annex A3 provides details on environmental comparisons between NGVs and EVs.

Key questions that arise for these investments include:

- The cost, certification, and insurance requirements for retrofitted natural gas vehicles (given that some of InfraCredit's mandated pipelines assess retrofitting); and
- The availability of CNG, LNG, or LPG – stakeholder consultations revealed that CNG and LNG are readily available and often more reliable than piped natural gas (regulated).

Box 2 The cost of conversion, certification, and insurance

The cost of converting, certifying, and insuring converted assets varies dramatically between different jurisdictions. The costs differential is based on regulatory regimes and the values that individuals place on risk (financial and safety).

These costs vary dramatically, and our market assessment shows that typical conversion costs in India range from $500 to $750 per vehicle whereas costs in the US are significantly higher. Higher costs are driven primarily by the EPA (US environment agency) which requires the certification of equipment and its installation by a certified technician. These costs are typically upwards of $4,000 per vehicle. The cost applicable to Nigeria would depend on the development and enforcement of the certification scheme.

In many of the markets where natural gas vehicles are predominant (e.g., India) the rules around car insurance are very relaxed. For assets financed with InfraCredit guarantees, insurance provision would depend on InfraCredit's risk appetite, the investment appetite of companies receiving the guarantees, and any obligations the companies have to other investors.

2.2.3 Other transport sector investments

InfraCredit's pipeline contains several other investments including ports and buses. Generally, these investments are aligned with the Paris Agreement; however, in the following sections we describe specific analytical parameters. In the longer term, the aspiration of the investments is to reduce their emissions. For buses and ports, these would be scope 1 and 2 emissions, including from internal power generation (captive plants for the ports) and the type of fuels used for buses.

2.3 Urban, semi-urban and rural infrastructure

There are areas of opportunity for investments aligned with the Paris Agreement in all other InfraCredit eligible sectors: ICT/telecoms, housing, inputs to infrastructure, urban infrastructure, water and waste, agriculture infrastructure, and social infrastructure. Opportunities within each sector include

climate change mitigation (e.g., captive power generation from clean sources, EE10[10]) and adaptation (climate-smart agriculture, water supply).

2.3.1 Telecommunications / ICT

Nigeria has more than 100 million mobile cellular subscribers. Mobile communications have revolutionised the sector and impacted positively on the socio-economic development of the country. Incentives to enhance the development of ICT and its enabling infrastructure for every part of the country including the rural areas are being provided.

InfraCredit's investment pipeline in the telecommunications / ICT sector is currently valued at $166 million. Most investments relate to the expansion of network infrastructure (towers and other equipment).
Power supply infrastructure plays a major role in running telecommunications networks with a benchmark network uptime of 99.98% required to maintain the reliability and quality of services. An unreliable and poor power supply to telecom tower sites hampers the efficient running of mobile network's operations. The unreliable grid power supply in Nigeria has traditionally seen telecom operators and tower companies rely heavily on diesel as their primary power source. The use of diesel generators as the default power source for off-grid and weak-grid telecom tower sites brings a high cost of power, especially considering diesel logistics and theft. Investments to increase EE or transition to cleaner fuels are likely cost effective and will benefit from affordable debt financing. These investments include energy storage (backup for ensuring uninterrupted power to weak- grid towers), EE (e.g., low energy-consuming air conditioning, such as free cooling units or DC air conditioners) and captive gas-fired or hybrid solar powered systems. Investments in this type of solutions are considered aligned with the Paris Agreement.

2.3.2 Affordable housing

The housing sector is not categorically included in Nigeria's emissions inventory, yet has a significant impact on emissions, particularly from residential energy usage. Housing structures, standards, and enforcement will impact the intensity of energy usage throughout the lifetime of the buildings, the overall affordability of the dwelling, and the carbon intensity of the materials used in construction.

InfraCredit's unmandated pipeline includes three affordable housing projects. These projects are valued at $64.1 million, which is over 20% of the total investments currently in the unmandated pipeline. Moreover, if Nigeria's population growth and urbanisation trends continue, affordable housing will remain a significant infrastructure need in the coming decades. Promulgating new housing standards was identified in Nigeria's NDC document to be critical to reducing emissions, particularly in mega-cities such as Lagos.

InfraCredit has an opportunity in new buildings designed to meet stringent EE standards, use low- energy lighting, net zero-carbon codes and standards, and, where relevant, the retrofitting of existing buildings to improve EE. InfraCredit will adopt IFC's EDGE certification[11] or the Nigerian Building Energy Efficiency Code (BEEC), as well as emissions considerations, as a guide to building design; and using lifetime affordability considerations in determining both building design and appliance selection in housing projects.

10 Primarily considering scope 1 and 2 emissions.

11 IFC created EDGE ("Excellence in Design for Greater Efficiencies") to respond to the need for a measurable and credible solution to prove the business case for building green and unlock financial investment.

2.3.3 Agriculture

Agriculture has been a non-trivial source of Nigeria's GHG emissions to date. However, it is not energy use but an increasing population of livestock, and fertiliser production, that will likely be key drivers in the future. Noting that the only agriculture load that could stimulate much investment in energy is irrigation for commercial farms at significant scale[12], most other agriculture investments are not significantly correlated with energy. Moreover, the effects of climate change in Nigeria could lead to a significant reduction in agricultural productivity and risk of food insecurity.

InfraCredit's agricultural infrastructure projects in its unmandated pipeline[13] are an excellent example of how infrastructure investments can be aligned to reduce the risks around climate change adaptation. Post-harvest storage solutions may provide a buffer against increased weather disturbances and food insecurity while reductions in food waste also result in less methane emissions.

In general, infrastructure that supports improved agricultural yields and reductions in methane emissions from livestock feeding and breeding can be said to be aligned with the Paris Agreement when it supports Nigerian NDC targets of "equitable increases in farm incomes,

12 Double Dividend: Power and Agriculture Nexus in Sub-Saharan Africa, 2017. https://www.eca-uk.com/wp-content/uploads/2017/08/Power-and-Agriculture-nexus-in-SSAfrica.pdf

13 Expansion of agro-storage facilities ($36 million) and rehabilitation and upgrade of agricultural silo facilities ($10 million)

enhancing food security and development... adapting and building resilience of agricultural and food security systems to climate change"[14].

Some specific suggested policies that incentivise traditional agroecological and climate-smart practices as strategies for climate change mitigation, adaptation and building resilience in the agricultural sector include composting, mulching, crop rotations, inter-cropping, agroforestry, biological pest control measures, cover crops, water harvesting[15]. InfraCredit will assess agricultural infrastructure to determine the alignment of such practices and evaluate long-term advantages in addition to the emissions reductions that may result.

2.3.4 Water & waste services

Nigeria's NDCs refer to potable water, waste and sewerage infrastructure, and to the strain they put on government at all levels. While not quantified, there is the objective to reinforce programmes to build and maintain wastewater and solid waste management facilities.

2.3.4.1 Water

States and local governments are responsible for provision of water services in Nigeria. There is no recorded private project or investment in the water and sewage sector in the last 20 years, according to the World Bank Private Participation in Infrastructure database. The National Water Resources Policy of 2016 recognises the importance for private sector participation to meet the rapidly growing demand. A key policy statement is that the "government will proactively involve the private sector in the delivery of efficient and sustainable water services to the citizens through appropriate Public- Private Partnerships".

There is, however, no significant evidence pointing to private investment in the sector. The Partnership for Expanded Water, Sanitation & Hygiene (PEWASH), 2016–2030, a government's programme to improve water supply and sanitation country-wide, has a total projected cost of N386 billion for water supply projects. Of this, only 5% are projected as a private-sector contribution[16], i.e., N19.3 billion (about $50m at today's exchange rates).

InfraCredit's project pipeline provides a good example of possible Public-Private Partnership (PPP) projects in water supply, with a proposed upgrade of a water plant and treatment infrastructure, development of 105km pipeline network and associated metering infrastructure under a Build Own Operate Transfer (BOOT) model under a 12-year water concession with State Governments.

2.3.4.2 Waste management

Urban solid waste management in Nigeria is the responsibility of local governments. However, with this tier of government not committing the necessary financial, material, and human resources to waste management; there has been increasing private-sector participation.
The World Bank Private Participation in Infrastructure database lists four major transactions in recent years, with a total investment of $150m[17]. The InfraCredit project pipeline also includes a similar example, with a proposed waste recycling and waste-to-energy plant.

14 Nigeria's Intended Nationally Determined Contribution, 2015. https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Nigeria%20First/Approved%20Nigeria%27s%20INDC_271115.pdf

15 Nigerian Youth's Suggested Inputs for the 2021 Nationally Determined Contributions

16 Water Resources Roadmap (2016-2030), https://www.waterresources.gov.ng/wp-content/uploads/2021/01/Medium-Long-Term-Strategy-2016-2030.pptx-updated1.pdf

17 Ajakanga Waste-to-Energy Plant, Solous 1 Material Recovery Facility, Kawo Recycling Plant, and Ojota Electronic Waste Recycling Facility

Eligible investments

Aligning investments with Paris Agreement goals will be considered in all new investments. There are three broad categories of projects:

- **Aligned projects** – close to zero GHG emissions or potential to be close to zero emissions;
- **Misaligned projects** – projects that are GHG emission intensive and are not aligned to the Paris Agreement; and
- **Conditional projects** – projects that, depending on project-specific factors, may be aligned or misaligned. A subset of conditional projects is also labelled as **transitional projects**. This refers to projects that emit some GHG during operation but are deemed necessary for the electrification and economic development of the country and are part of a transition to a zero-carbon electricity system.

InfraCredit has committed that no new misaligned projects in the energy sector should enter our pipeline.

This section provides an overview of eligible investments as well as decision trees, providing specific project eligibility criteria for certain investment types[18] (particularly those that use fossil fuels), e.g., emission reductions compared with the counterfactual; urgency of the infrastructure needs; adherence to technological best practice on climate emissions; and plans and feasibility to convert to other energy sources at a future date (commitment to be part of the transition to zero carbon by 2050).

18 The methodology to determine eligibility of projects is based on PIDG's climate change standard of August 2020 (Annex 1: Methodology to assess Paris Alignment of projects in the energy sector) and their Transport Sector Climate Change Strategy of January 2021. The proposed eligibility criteria also take into consideration the policy on "Aligning UK international support for the clean energy transition" of March 2021.

3.1 Energy supply

RE projects (solar, wind, small hydro, etc.) are considered aligned projects. New coal-fired or oil-fired power plant and associated upstream infrastructure are considered misaligned projects. New gas-fired power plants and hybrid off-grid energy generation are classified as conditional and transitional projects. These are projects that emit some GHG during operation but are deemed necessary for the electrification and economic development of Nigeria, may displace more carbon-intensive forms of energy (e.g., diesel or coal) and are part of a transition to a zero-carbon electricity system. Large hydro is also placed in the category of conditional, as GHG may be released during operation of projects involving construction of a dam, due to decomposition of flooded organic material. Conditional projects will be considered aligned with the Paris Agreement if they meet certain conditions, which are outlined in the subsections below.

Table 1 Framework for assessing Paris alignment of energy sector investments

Degree of alignment	Investment types
Misaligned projects	• New coal-fired power plants or upstream investment in coal infrastructure • New oil-fired power plants or upstream investment in oil infrastructure (e.g., oil extraction and processing) • Upstream investment in new gas extraction and production
Conditional and transitional projects	• Geothermal, large hydro and biomass projects • Electricity transmission and distribution network improvements and expansion • Natural gas-fired power plants • Gas storage, terminals, and distribution networks (for LPG, CNG and LNG) • Off-grid hybrid power generation (combination of RE, battery storage and fossil fuels)
Paris Agreement- aligned projects	• RE projects: solar, wind, small hydro, wave, tidal • RE-based off-grid projects • 'Smart grid' and energy storage projects

Source: adapted from PIDG Climate Change Standard of August 2020

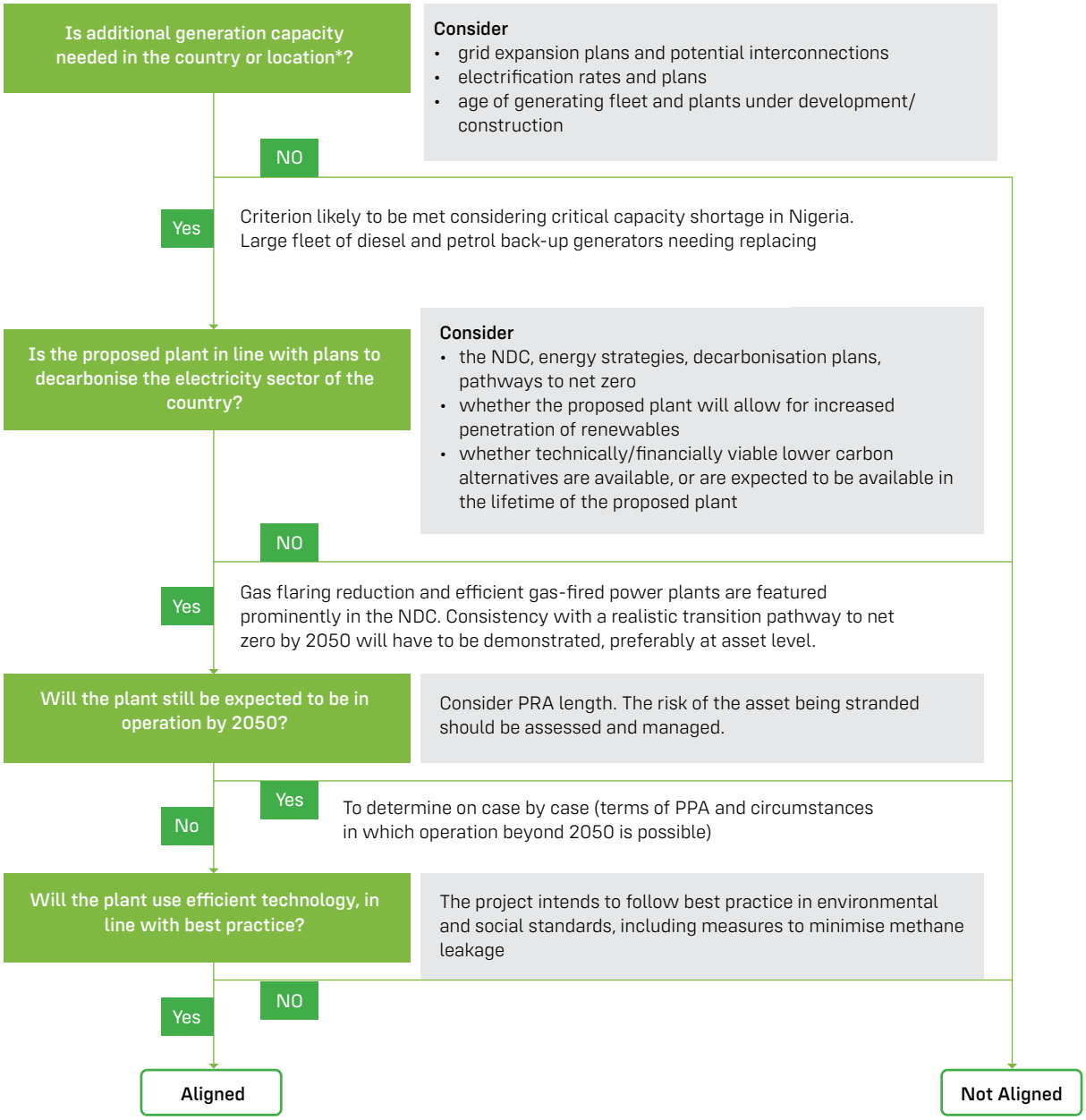
3.1.1 Natural gas-fired power plants (utility scale)

Gas-fired power plants are aligned with Nigeria's decarbonisation strategy (to the extent that they help reduce gas flaring and/or replace diesel generators in off-grid/captive uses[19]). They are also very much in line with Nigeria's power sector plans, which promote decentralised gas plants near load centres in the medium term and utility-scale plants in the long-term. Utility-scale gas-fired

19 See annex 0 Nigeria's Commitments under the Paris Agreement

generation would in principle also allow for the deployment of a significant capacity of intermittent renewables. For these reasons, gas-fired power plants are likely to be considered aligned projects, provided they meet the additional requirements of the decision tree shown in Figure 1, regarding alignment with decarbonisation plans, operation plans after 2050, and the use of efficient technology in line with best practice.

Figure 1 Decision tree for gas-fired power plants (utility scale)



Source: adapted from PIDG climate change standard

** Considering severe transmission capacity constraints in Nigeria, capacity needs may need to be assessed locally as opposed to countrywide.*

Considering the general alignment of new gas-fired plants with Nigeria's power sector plans and Paris Agreement commitments, the additional analysis that would be required to determine eligibility will consider[20]:

- **Decarbonisation analysis.** The role of gas is established in the NDC, but not in a long- term decarbonisation pathway to net zero by 2050. For this reason, it will need to be demonstrated that: the project cannot viably be replaced by RE sources, and that it is consistent with a realistic transition pathway to net zero by 2050 at the latest, including demonstrating that mitigation measures have been considered, preferably at asset level.
- **Plans for operation beyond 2050.** Consideration of whether the asset will continue to be in operation beyond 2050 and, if so, whether it will continue to emit CO2. To assess this, it is necessary to understand the terms of the power purchase agreement (PPA) and the circumstances in which operation beyond 2050 is possible. If the PPA extends beyond 2050, is there a plan to switch to a low-carbon fuel, retrofit with carbon capture and storage (CCS), operate with ancillary services, or cease production?
- **Whether the plant uses efficient technology, in line with best practice.** An important consideration is that the lowest emissions technology is selected, to consider whether the plant is the least-emitting gas technology option for the size and role of project[21], within a reasonable cost differential.

3.1.2 Natural gas-fired power plants (captive and off-grid)

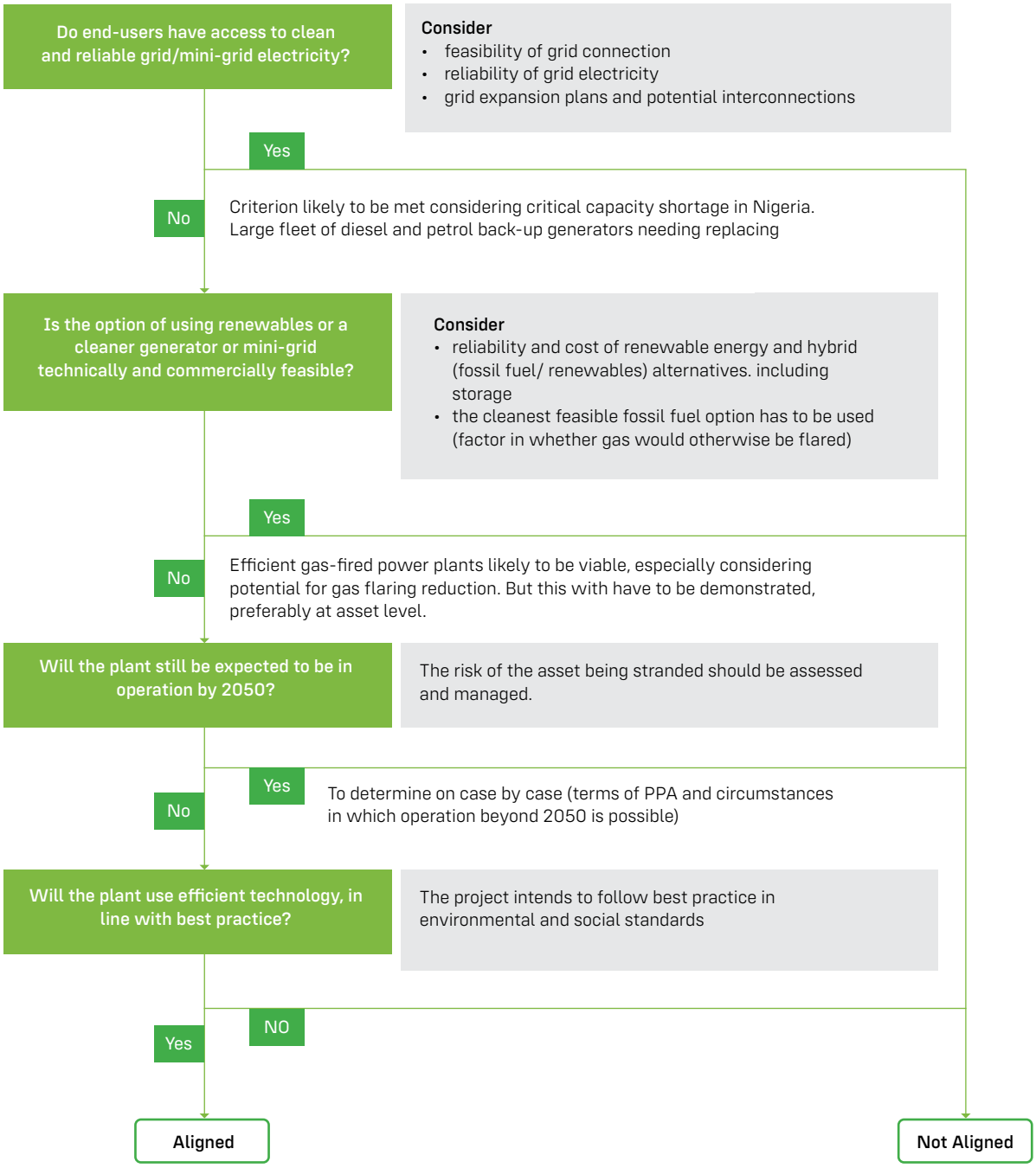
Small-scale gas-fired power plants can be used in areas where no mains grid connection is available or where grid power is unreliable. They can supply electricity to a wide variety of end-users, including commercial and industrial (e.g., agro-processing facilities, ICT infrastructure, and manufacturing), as well as government offices and public utilities.

Similar to utility-scale gas-fired power plants, these power plants are aligned with Nigeria's decarbonisation strategy to the extent that they help reduce gas flaring and/or replace diesel generators. For these reasons, these power plants are likely to be considered aligned projects, provided they meet the additional requirements of the decision tree (shown in Figure 2), regarding alignment with decarbonisation plans, operation plans after 2050, and the use of efficient technology in line with best practice.

20 Guidance from the CDC to determine alignment of natural gas plants with the Paris Agreement provides a thorough framework for assessing these questions. CDC Group, December 2020. "Natural Gas Power Plants: Assessing alignment with the Paris Agreement".

21 For reference, IFC benchmarks in gCO2/kWh for gas-fired power plants under 300MWe of capacity are CCGT (361–488), Simple cycle (448–673), Reciprocating engine (412–531). IFC EHS guidelines for thermal power plants (2017) (Draft for second public consultation) (see Table 4).

Figure 2 Decision tree for gas-fired power plants (captive and off-grid)



Similar to utility-scale power plants, the additional analysis that would be required to determine eligibility includes a decarbonisation analysis, plans for operation beyond 2050, and whether the plant uses efficient technology, in line with best practice.

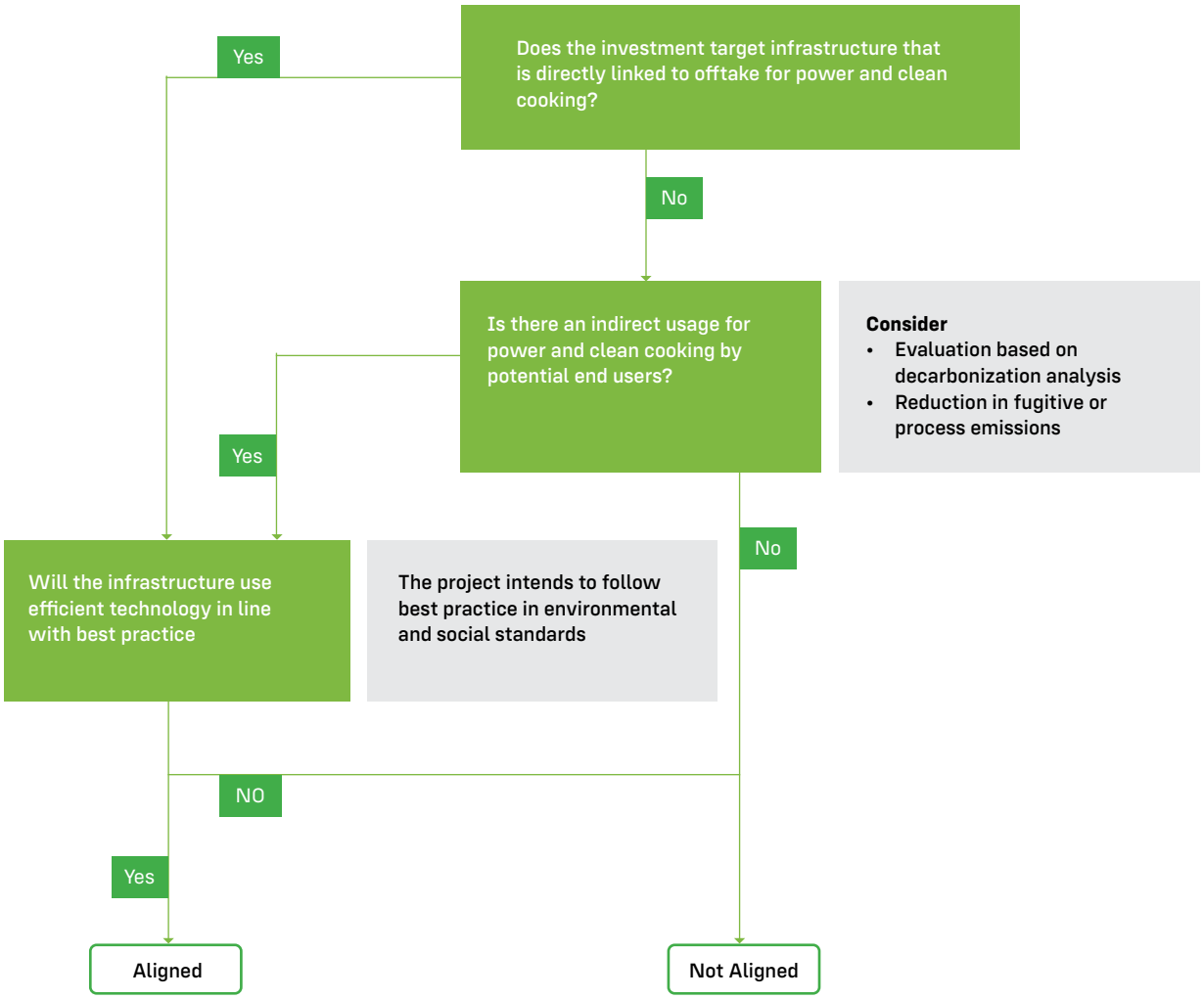
3.1.3 Gas infrastructure

The alignment of gas infrastructure (e.g., pipelines, LNG terminal) associated to specific gas-fired power plants will be determined based on the decision tree for power plants above. Typically, the primary purpose/use[22] will be for electricity generation, although other categories (e.g., clean cooking,

22 Primary purpose/use means more than 60 per cent of the capacity

NGVs) of use will be considered on a case-by-case basis. It is often not possible to assign a gas pipeline or LNG terminal to one specific power plant, so a more qualitative approach is needed. Figure 3 presents the decision tree that outlines the investment alignment decision making.

Figure 3 Gas infrastructure decision tree



Source: Germanwatch & NewClimate Institute (2018). Aligning investments with the Paris Agreement Temperature Goal – Challenges and Opportunities for Multilateral Development Banks.

When the investment, gas pipeline or LNG terminal is used to support one specific power plant, the electricity generation decision tree is used to assess alignment (Figure 1 and Figure 2). If the power plant is categorised as aligned, the pipeline or LNG terminal is also aligned. Projects that aim to refurbish existing infrastructure and result in a reduction of fugitive emissions are also considered to be aligned.

New pipelines could be aligned. This alignment may be supported by scientific scenarios but should also incorporate additional criteria[23]. Two dimensions are identified to be priority areas for consideration:

23 Germanwatch & NewClimate Institute (2018). Aligning investments with the Paris Agreement Temperature Goal – Challenges and Opportunities for Multilateral Development Banks.

- **Future demand:** *'Is it possible to cover projected demand without investing in new gas infrastructure?'* Natural gas demand is subject to several factors: efficiency improvements and electrification of demand sectors, for example, could lower demand significantly. A detailed projection of gas demand in the country supplied by the investments in natural gas infrastructure is necessary to justify the investment that should only be considered if no other alternatives are available.
- **Context evaluation:** *'How does the project fit into a national 2050 decarbonisation pathway?'* Any new investment project needs to fit into a pathway that takes into account a 2050 decarbonisation target to limit the risk of stranded assets. Ideally, where a country has a strategy for the energy sector that leads to decarbonisation around 2050, this can also be used as an indication for investments in gas pipelines. As this is not the currently the case in Nigeria, scientific scenarios or bottom-up models can be used to provide insights. Investments in natural gas infrastructure have a high risk of becoming stranded assets in Paris-aligned scenarios. Therefore, an important safeguard is to assure that investments have a clear plan to be repurposed or decommissioned before the year of full decarbonisation.

3.1.4 Other gas applications

In addition to power generation, gas is expected to play a significant role in transportation (CNG and LPG for vehicles), domestic use (LPG for cooking), and industry (cooling, heating). Eligibility of gas in transportation is assessed in section 3.2.

LPG projects will be considered on a case-by-case basis, in part considering the end use of the LPG and any displacement of a more GHG emission-intensive fuel. LPG for supplying gas to households for cooking is likely to be considered Paris-aligned given the advantages in displacing wood or charcoal, reducing deforestation, health benefits, and lack of alternatives[24].

3.1.5 Off-grid hybrid power generation

Off-grid hybrid power generators have the potential to reduce emissions from captive diesel generators of commercial and industrial users. They also play an important role in supplying power to mini-grids for rural electrification. This type of project is aligned with Nigeria's NDC and the electricity sector's plans, with initiatives such as the NEP and EEI incentivising private sector investments in these areas.

For many off-grid projects, such as solar PV powered mini-grids, InfraCredit acknowledges that generally diesel generators are needed where intermittent sources of RE are used. InfraCredit will support off-grid projects which[25]:

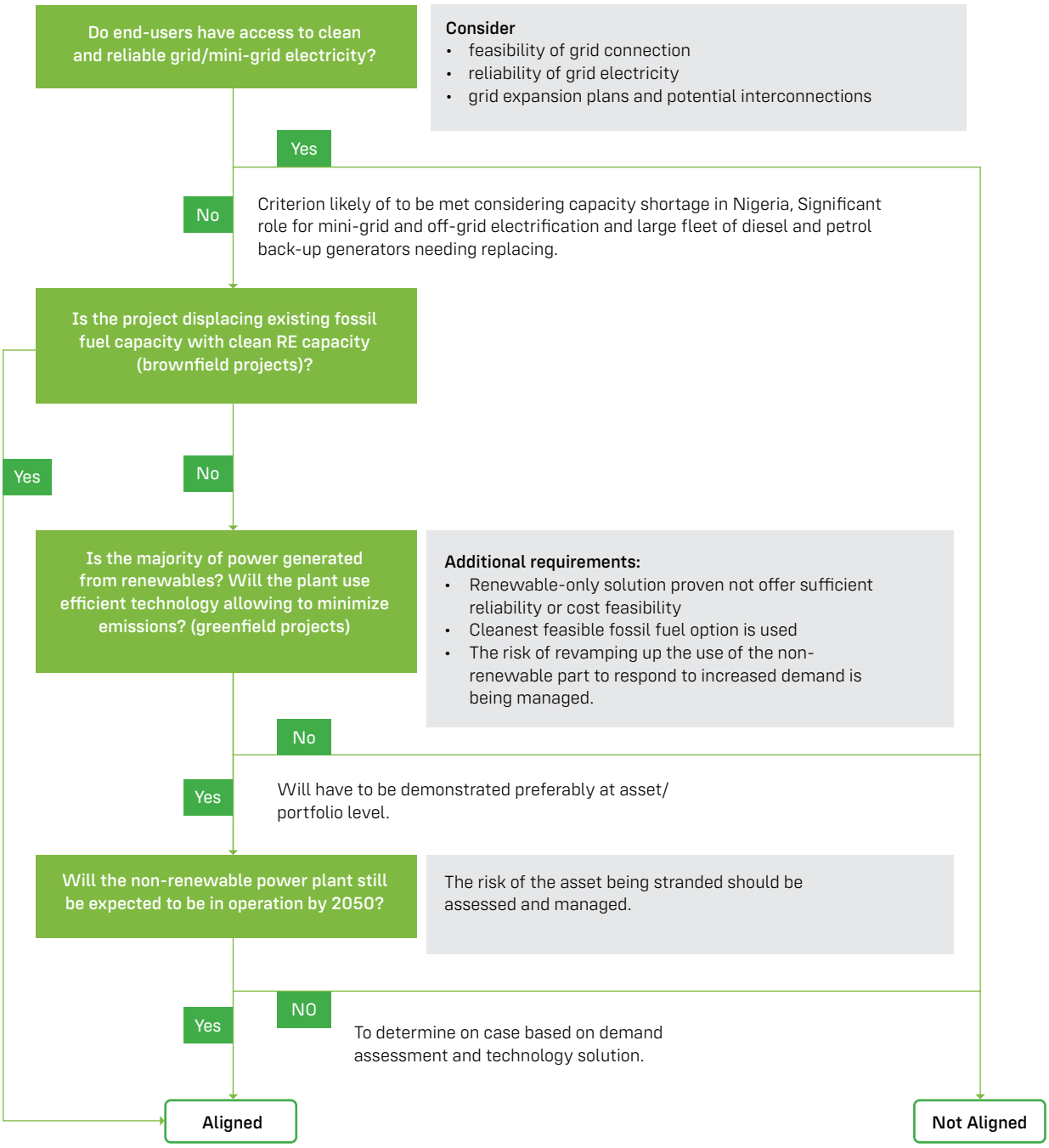
- Generate most of the power from renewable sources (greenfield projects); and
- Displace existing fossil-fuel capacity with clean RE capacity (brownfield projects).

24 Note that LPG for cooking is an accepted policy exemption in the guidance for 'Aligning UK international support for the clean energy transition': "LPG has a key role to play in providing access to clean cooking and heating, given its time saving and health advantages and relatively low emissions when compared with solid biomass, coal and oil, until the transition to renewable fuels is feasible."

25 Based on PIDG climate change standard

Figure 4 presents the decision tree for off-grid hybrid power generation.

Figure 4 Decision tree for off-grid hybrid power generation



Source: adapted from PIDG climate change standard

Considering the general alignment of off-grid hybrid power generation with Nigeria's power sector plans and Paris Agreement commitments, the additional analysis that would be required to determine eligibility will explore:

- **Whether most of the power supply comes from solar PV/renewable (greenfield projects) or the project displaces existing fossil-fuel capacity (brownfield projects).** This will be determined based on the energy demand forecast (in kWh) and the projected fuel mix to meet that demand forecast during the lifetime of the project.
- **Whether the plant uses efficient, technology, in line with best practice.** For example, whether battery systems of demand-side management solutions are included so that the non-renewable power generation unit can operate efficiently, with a minimum of carbon emissions.
- **Plans for operation beyond 2050.** Consideration to phase out non-renewable power generation unit after 2050.

3.2 Transport

Table 5 provides a summary of the main areas of interest to InfraCredit. In addition to highlighting general observations on the alignment to the Paris Agreement/PIDG climate change strategy, we adapted decision trees for some of the below sectors. In others we set out the key questions in determining whether the investments are appropriate.

Table 2 Alignment of transport projects with Paris Agreement

Transportation subsector	Alignment with Paris Agreement/ PIDG climate change strategy	Other analytical considerations
Roads	**Conditional alignment** for non-fossil fuel supporting projects provided they meet the specified criteria	• Connecting low income/remote communities to critical services? • Reducing journey times? • Reducing distance travelled?
Alternative fuels (electric vehicles, CNG, and possibly hydrogen)	Generally **aligned** as most alternative fuels are less polluting than petrol and diesel	• Pollution and emissions by fuel type? • Underlying electricity/CNG emissions vs alternative emissions? • Cost competitiveness of future emissions?
Buses	Generally **aligned**	• Use of cleaner fuel vehicles?
Rail	Mainly **aligned** where these replace non-fossil fuel road freight transport and general passenger transport	• Type of rail freight demand being serviced • Are there any plans to electrify railways in the future?
Ports	Generally **aligned** if specific investments are not focused on fossil-fuel processing and transport	• Type of port freight being transported • Type of associated embedded power generation
Airports	**Conditional alignment** for investment focusing on addressing unserved and underserved demographics	• Airport supported in less developed and/or conflicted parts of Nigeria? • Rehabilitation/refurbishment deploying efficient technology, RE, EE, etc.

3.2.1 Roads

Investment in roads is conditionally aligned with the Paris Agreement and PIDG's climate change strategy. However, we apply a decision-making framework with the following consideration:

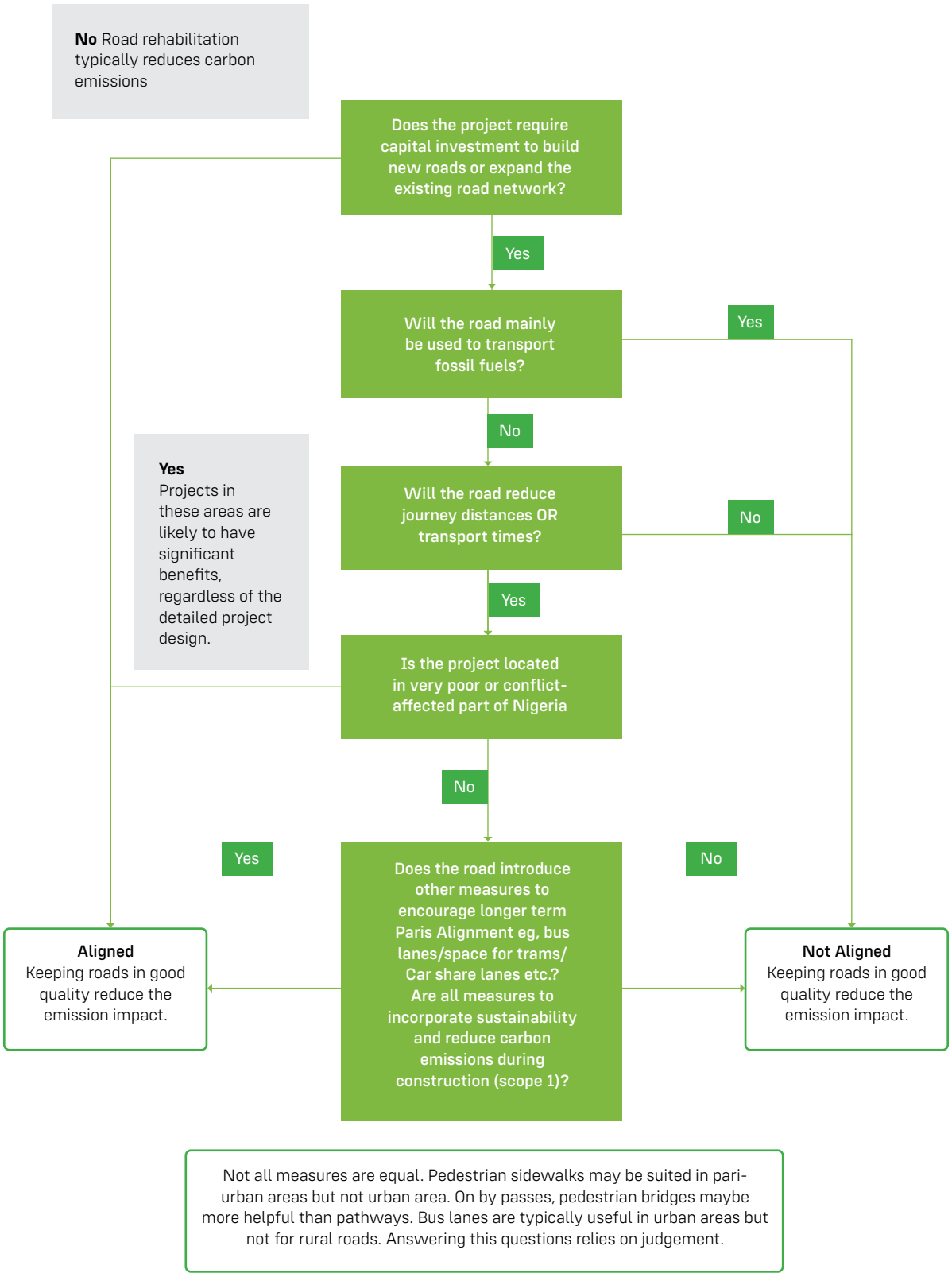
- **The counterfactual:** car ownership in Nigeria is forecast to dramatically increase alongside economic growth (even if the current low levels of ownership per capita persist). Reduced investment on road network expansion will inevitably involve greater stoppage time, deceleration, and acceleration.
- **Road rehabilitation is almost always aligned with the Paris Agreement and PIDG's climate change strategy.** Bad roads contribute significantly to acceleration and deceleration of vehicles which contributes to energy consumption and emission production. As such, regardless of the road type and/or traffic attempts to reduce stopping, deceleration, and acceleration is almost always likely to be aligned with the Paris Agreement. Additionally, these measures will likely improve road safety.
- **Journey time reduction analysis could be more nuanced to consider the distributional impact of the road.** The analysis is extremely relevant when choosing between different climate-compatible investments and would involve analysis on the time saving based on:
- **The purpose of the vehicle** e.g., work, commuting, other. The value of time changes significantly based on the type of activity.
- **The type of vehicle** e.g., car, large goods vehicle (lorries/freight) and public service vehicle (buses).

In addition to the above considerations, we would expect where possible and feasible that project developers will incorporate sustainable supply chain and asset management practices. On marginal projects InfraCredit would consider additional factors such as:

- Sustainability practices beyond a reduction in Scope 1 emissions. We expect the analysis on Scope 1 emissions to have been factored into the Cost-Benefit Analysis (CBA), and decision-making framework.
- Emphasis on an equitable and fair supply chain management such as the inclusion of smaller contractors/ sub-contractors. These will typically expand the job footprint from these projects.
- Long-term asset management considerations, which may reduce future environmental costs (though these are typically hard to quantify beyond asset life improvement).

This analysis will be subjective since the efforts are hard to quantify. The additional factors would be considered at the last stage of project decision making. While these factors are not independently likely to change InfraCredit's decision they can help to choose between comparable projects.

Figure 5 Decision tree for road investments



Source: adapted from PIDG climate change strategy

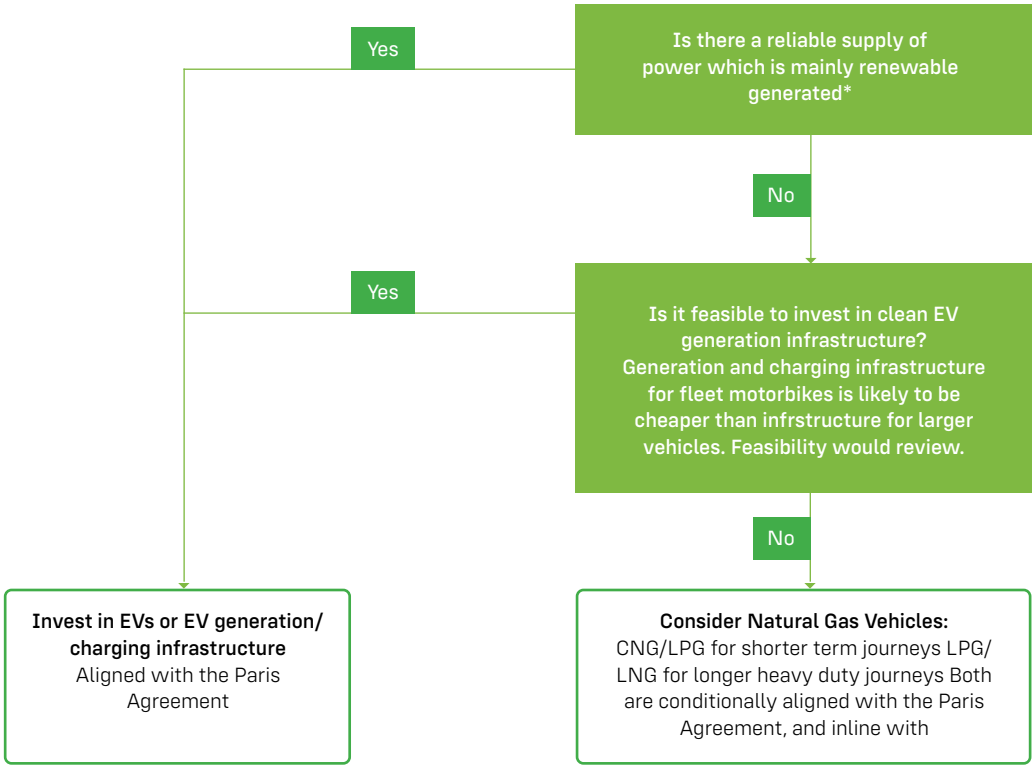
3.2.2 Alternative-fuel vehicles

Alternative-fuel vehicle decision making will be driven by the type of car or vehicle that is being considered, and the purpose that it fulfils. Annex 3 provides information which:

- Illustrates how the financial competitiveness of NGVs and EVs could be considered; and
- The comparative environmental benefits of EVs and NGVs over traditional combustion engines.

Both types of investments are aligned with PIDG's climate change strategy displacing diesel and petrol vehicles that dominate the Nigerian car market. Given the challenges in the power sector it is difficult to envision that EVs (with clean(er) charging solutions) will be a viable option for displacing traditional combustion engines. The possible exception to this is motorbikes, where the energy requirement is far lower. Figure 6 illustrates the decision-making framework for alternative fuel vehicles.

Figure 6 Decision tree for alternative fuel vehicles



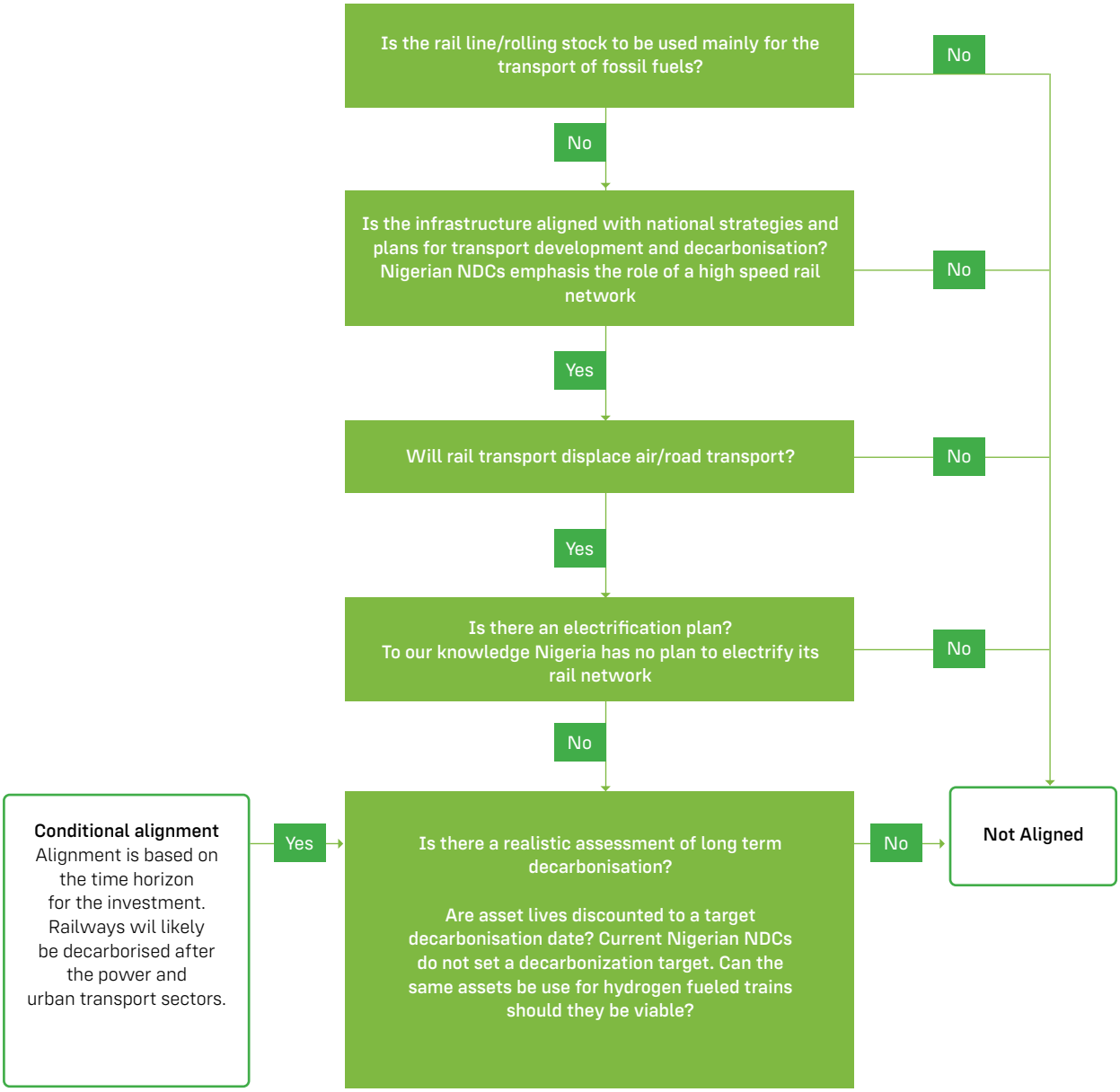
Source: adapted from PIDG climate change strategy

**renewable generation/clean EV generation refers to contexts where most of the production is through renewable sources.*

3.2.3 Railway investments

We consider most railway investments in Nigeria to be conditionally aligned. Current NDCs do not give a target for railway electrification, and near to medium term railway investments appear conditionally aligned in the near to medium-term. Figure 7 presents the decision tree for railway investments.

Figure 7 Decision tree for railway investments



Source: adapted from PIDG climate change strategy

An analysis of specific investments will be based on the asset life of the proposed investments which vary between the railway track and the rolling stock:

- Rolling stock has an asset life between 15 – 20 years; and
- Railway track has an asset life of approximately 50 years.

Where existing rolling stock or railway track needs to be rehabilitated (as may be the case in Nigeria) the asset lives will vary. A railway track with a longer asset life is compatible with overhead electrification and is therefore no obstacle to overall decarbonisation.

3.2.4 Port investments

Port investments in Nigeria would generally be considered aligned with the Paris Agreement as there are typically few Scope 1 and Scope 2 emissions produced by ports. Consideration of ports within the Nigeria context will need to consider:

- *Is the majority of throughput from the port fossil fuel related e.g., crude oil, refined oil or coal? If the value of throughput is fossil fuels then the investment should be considered not aligned.*
- *Is the port designed to reduce energy consumption from a whole solutions perspective? E.g., is it located at a short distance from feeder ports, and logistic hubs? Ports which are designed or adapted to reduce overall emissions should be encouraged.*
- *Does marine freight displace existing or potential road and/or air freight? Marine freight transport is less carbon intensive than other transport sources.*
- *How is the port powered? Investments in new generation should follow the decision- making trees identified in section 3.1.*

Most InfraCredit opportunities will involve reviewing and assessing existing ports (rather than constructing new ports). In these cases, it is likely that investment in the ports is aligned with the Paris Agreement because these ports are necessary and more environmentally-efficient than their alternatives (air and road transport).

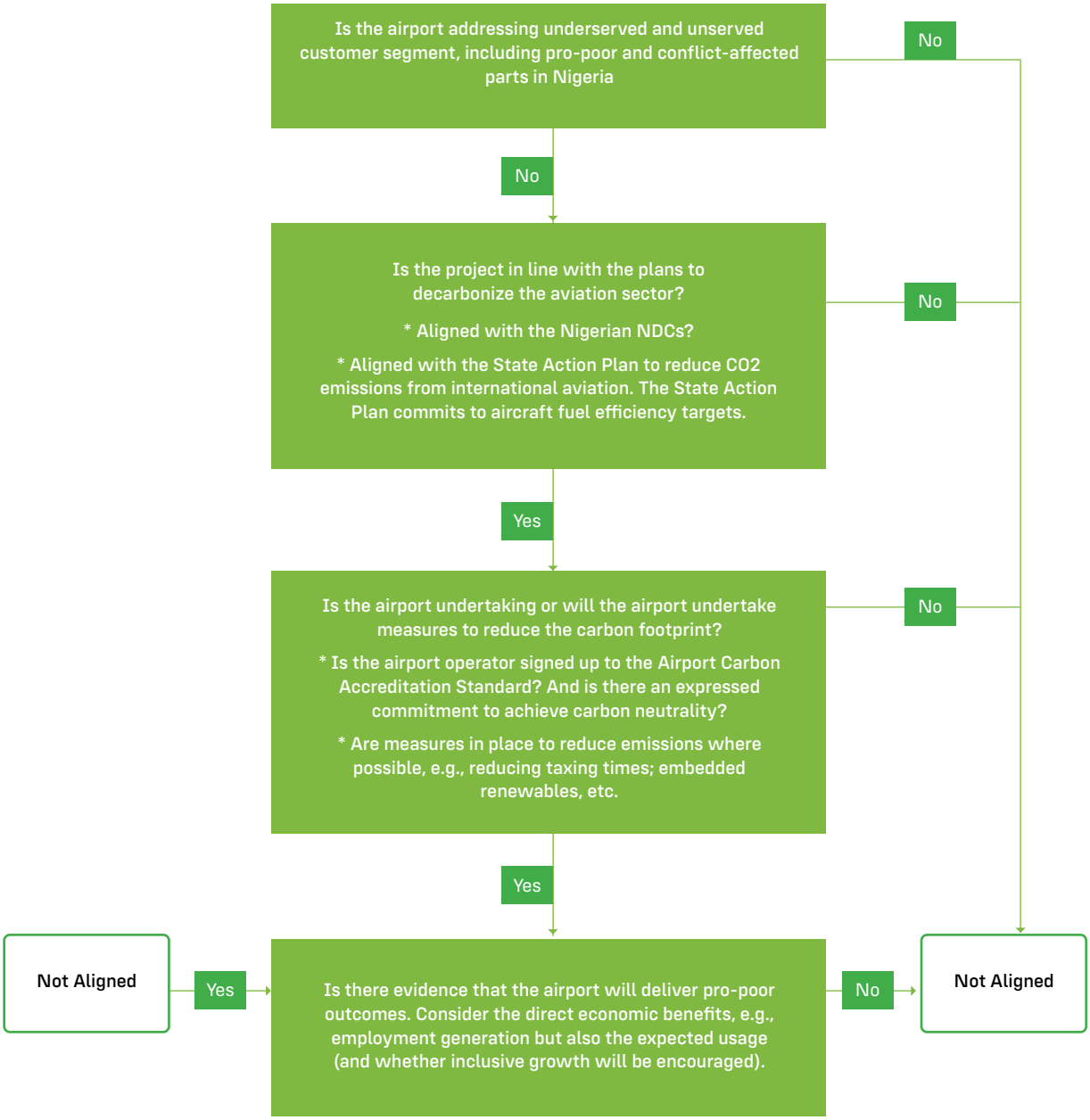
In Nigeria, the ports, as with other businesses, are likely to have diesel embedded generation. Investments in the ports should therefore consider emissions from these sources based on historical energy consumptions patterns. We would consider the investments to be conditionally aligned if:

- Carbon emissions from the port's own power solution are no more polluting than the grid. This may be achieved by using renewable and diesel/gas hybrid solution; or
- The investment by InfraCredit fully exploits opportunities to move towards clean(er) fuels where possible and economically viable, e.g., to captive gas-fired power, rooftop solar, battery peak shifting.

3.2.5 Airport investments

Airport investments by InfraCredit will not be climate aligned unless they are addressing underserved and unserved demographics, including poor or conflict-affected parts of Nigeria. Figure 8 presents the decision tree for airport investments.

Figure 8 Decision tree for airport investments



Source: adapted from PIDG climate change strategy

3.3 Urban, semi-urban, and rural infrastructure

The eligibility of urban, semi-urban, and rural infrastructure will be determined from the perspective of energy generation (if projects include captive power, such as off-grid telecom towers) and energy use (EE of industrial processes or in buildings). Climate change adaptation benefits associated to infrastructure projects should also be incentivised. For example:

- For investments in ICT infrastructure including captive power generation, the decision tree of either section 3.1.3 (gas-fired power plants for captive/off-grid uses) or section 3.1.5 (off-grid hybrid power generation) can be used, depending on the case. The investments can also be evaluated based on their EE (e.g., low energy-consuming air conditioning, such as free cooling units or DC air conditioners).
- For investments in affordable housing, new buildings should meet stringent EE standards, use low-energy lighting, net zero carbon codes and standards, and, where relevant, the retrofitting of existing buildings to improve EE. The EDGE certification or the BEEC, as well as emissions considerations should be used as a guide to building design; and lifetime affordability considerations be used in determining both building design and appliance selection in housing projects.
- Agricultural infrastructure investments are generally aligned with Nigeria's NDC targets when they result in equitable increases in farm incomes, enhance food security and development, or adapt and build resilience of agricultural and food security systems to climate change. In cases where there are applicable decision trees, such as those for captive or off-grid gas and hybrid power generation (sections 3.1.2 and 3.1.5 respectively) or alternative fuel vehicles (section 3.2.2), they may be used as long as the outcome does not substantially negatively impact these targets outcomes.
- Water and solid waste management infrastructure in InfraCredit's pipeline (e.g., water treatment, water distribution, waste recycling) are generally aligned with Nigeria's NDC. Waste-to-energy projects on the other hand may have to be considered on a case-by- case basis. Waste-to-energy incineration is sometimes promoted as a low-carbon source of energy, but evidence suggests it has more adverse climate impacts than conventional electricity generation from gas[26]. A carbon intensity analysis would be conducted, accounting for avoided waste management emissions. In addition, recycling and composting should be maximised for carbon savings and other environmental benefits. Specific guidelines for the eligibility of solid waste management projects have not yet been provided by PIDG or other sources evaluating Paris-alignment of development banks. For investments that relate specifically to captive power generation or vehicle fleets, investment decision trees of sections 3.1 and 3.2 would be used.

26 Zero Waste Europe, 2019. The impact of Waste-to-Energy incineration on climate: Policy Briefing.

Specific investment opportunities

Table 3 summarises the investment opportunities for InfraCredit to accelerate clean and transitional energy infrastructure investment in Nigeria. These are the opportunities identified in section 0 for each of the sectors of interest, considering the eligibility requirements of section 3.

Table 3 Summary of investment opportunities

Sector	InfraCredit eligible activities	Paris-aligned opportunities	Conditional/transitional opportunities
Energy supply	Energy generation, transmission, and/ or distribution of electricity, including rural electrification.	• Utility-scale RE projects	• Gas-fired plants at gas flare sites • Captive and off-grid gas-fired generators • Off-grid solar/hybrid power generation • LPG for domestic applications/cooking
Transport	Fixed transportation infrastructure including toll roads, bridges, tunnels, light and heavy rail systems and railway equipment, airports (passengers and freight), ports and harbours. Storage facility including warehousing and bulk storage/handling facilities which may include certain moveable assets. Other transport infrastructure includes vehicles, buses and railway rolling stocks (locomotives and carriages).	• Investments in rehabilitation of roads • Electric vehicles (provided the source of power is decarbonised) • Ports (if specific investments are not focused on fossil- fuel processing and transport)	• Investments in new roads (provided they are not primarily intended for fuel transport) • Alternative fuel vehicles (natural gas vehicles – LNG and CNG) • Railway (provided there is a realistic plan for long-term • decarbonisation and the purpose is not to mainly transport fossil fuels) • Airport (provided it addresses capacity gap for underserved and unserved population)

Telecoms/ ICT	Development and operation of (i) long distance and local telephone services, cellular radio telephone services, and other radio common carrier **communications** service; (ii) telegraph, microwave, and private **communications** networks, email, and other emerging telecommunications **technologies.**	• Investments in telecoms infrastructure with clean captive power (renewables) • Investments in energy-efficient telecoms equipment	• Investments in telecoms infrastructure powered by gas or hybrid power source
Gas transportation, distribution, and storage	Gas pipelines and bulk storage/ logistical facilities and downstream gas development.		• Gas infrastructure linked to eligible power generation or end uses (e.g., transport, LPG for cooking)
Urban infrastructure	Provision of economic and social infrastructure (e.g., housing, hospitals, education) within towns and cities.	• New buildings designed to meet stringent EE standards, such as BEEC or EDGE • Retrofitting of existing buildings to improve EE	
Inputs to infrastructure	Other high impact activities promoting the development of basic infrastructure including infrastructure component of industrial or agro- industrial projects assembly of goods, equipment, plant and buildings or the provision of services, producers of pipes, pumps, switching equipment, cables, bricks, tarmac, and other basic materials used in infrastructure construction.	• Electricity meters to incentivise EE of end users (especially residential) • Infrastructure that supports improved agricultural yields and reductions in methane emissions from livestock's feeding and breeding • Post-harvest storage solutions • Energy-efficient equipment, appliances, and materials	
Water & solid waste services	Urban/rural freshwater production and treatment, supply and distribution, bulk water supply (water reservoirs, transfer schemes, dams, and pipelines) sanitation, solid waste disposal/ collection and waste treatment.	• Water plant and treatment infrastructure, managing methane emissions from wastewater • Water distribution • Solid waste recycling facilities	• Waste-to-energy projects

With regards to the role of InfraCredit in these investments:

- As a provider of **guarantees**, InfraCredit is uniquely placed to support the investments outlined above, enhancing the credit quality of the long-term local currency debt finance that these infrastructure projects need, and attracting funds from pension funds, insurance firms and other long-term investors.
- Many of the projects in the power sector (e.g., mini-grids, small-scale renewables) face additional challenges in obtaining the required financing. As outlined in section 1.1, transaction sizes are relatively small, and developers lack strong balance sheets and consistent profitability, among other factors. There is an opportunity for **blended finance solutions** to address risks and be leveraged to significantly increase the supply of finance for clean energy projects. These types of solutions may also be relevant for financing Nigeria's updated NDC targets in clean cooking, water infrastructure and forestry.
    - For this purpose, InfraCredit and GuarantCo (through a grant from the Technical Assistance Facility of the PIDG (TAF)) are co-funding the establishment of a Clean Mini-Grid/Off-Grid Energy Local Currency Infrastructure Fund that will be focused on clean energy mini-grid and off-grid power projects, initially targeting specific bankable project pipelines.
    - InfraCredit will work towards accreditation as a direct access entity (DAC) under the Green Climate Fund (GCF) scheme. There is a strong alignment between the Clean Energy Programme's objectives and the GCF's transformational approaches of catalysing climate innovation, de-risking investment to mobilise finance at scale and mainstreaming climate risk and opportunities into investment decision-making to align infrastructure finance with sustainable development.

Roadmap for transition

The roadmap associated to the Clean Energy Transition Strategy provides a timeline for the implementation of the strategy with corresponding milestones and targets (see Figure 9 below). The roadmap should consider the timeline for NDC updates (as ambitions will be scaled up every 5 years) as well as the policy context in each of the sectors in which InfraCredit operates. For the transition timing, we note that it is also important to consider the lifetime of assets invested in, to avoid the risk of locking in carbon emissions or the risk of stranded assets. For example, considering a combined- cycle power plant has an operating life of 25 to 30 years, it is possible that the asset will continue to be in operation (and emitting CO_2) beyond 2050. This is already taken into consideration in decision trees but will also be considered to set objectives in the roadmap.

InfraCredit is considering the following options to set measurable targets as part of the roadmap. These include:

- Actual targets based on capital allocated to particular projects or thematic areas e.g., allocating a certain amount of capital to solar projects.
- Portfolio relative targets driven by the climate change agenda, to ensure that the overall portfolio remains Paris aligned with the majority of investments aligned to the principles of the Paris Agreement.
- Limits on sectors invested in either by InfraCredit or developed funds, e.g., no financing of large baseload gas Independent Power Producers (IPPs), subject to commercially viability of existing alternatives.
- Limiting absolute emissions from the portfolio (e.g., in terms of tonnes of CO2 emitted by projects financed by InfraCredit) or emissions intensity of portfolio (tCO2e/mUSD). The advantage of this approach is that it would be technology agnostic, leaving more flexibility to invest in different project types.

Additionally, InfraCredit would consider:

- **Investor priorities:** How do investors consider their priorities i.e., is this in absolute investment terms to particular technologies or thematic areas or will they not invest in funds with non-Paris aligned investment goals.
- **Nigerian investment priorities:** Does the Nigeria government have time-bound sectoral targets that can be factored into an internal roadmap?
- **Average market investor portfolio:** InfraCredit given the nature of its work and investors aim to be at the frontier or towards the front of Environmental, Social, and Corporate Governance (ESG) conscious investors in Nigeria.

Generally, we consider that a combination of these options proposed is appropriate – some of which have already been implicitly integrated into our operations. The exact weightings will be determined based on expectations of existing and potential investors, and their explicit or implicit goals.

InfraCredit would likely consider setting up separate funds for transitional and aligned investments. This would allow different investors with different appetites for investing in transitional technologies to invest in InfraCredit in line with their internal policies and rules. More broadly, to make itself attractive to ESG conscious investors InfraCredit could target a portfolio which changes its weighting of transitional to fully aligned investments. These could match Nigeria NDCs which are generally developed assuming the influx of ESG private or donor financing.

Figure 9 An Overview of the 10 to20-year Energy Transition Strategy and Roadmap

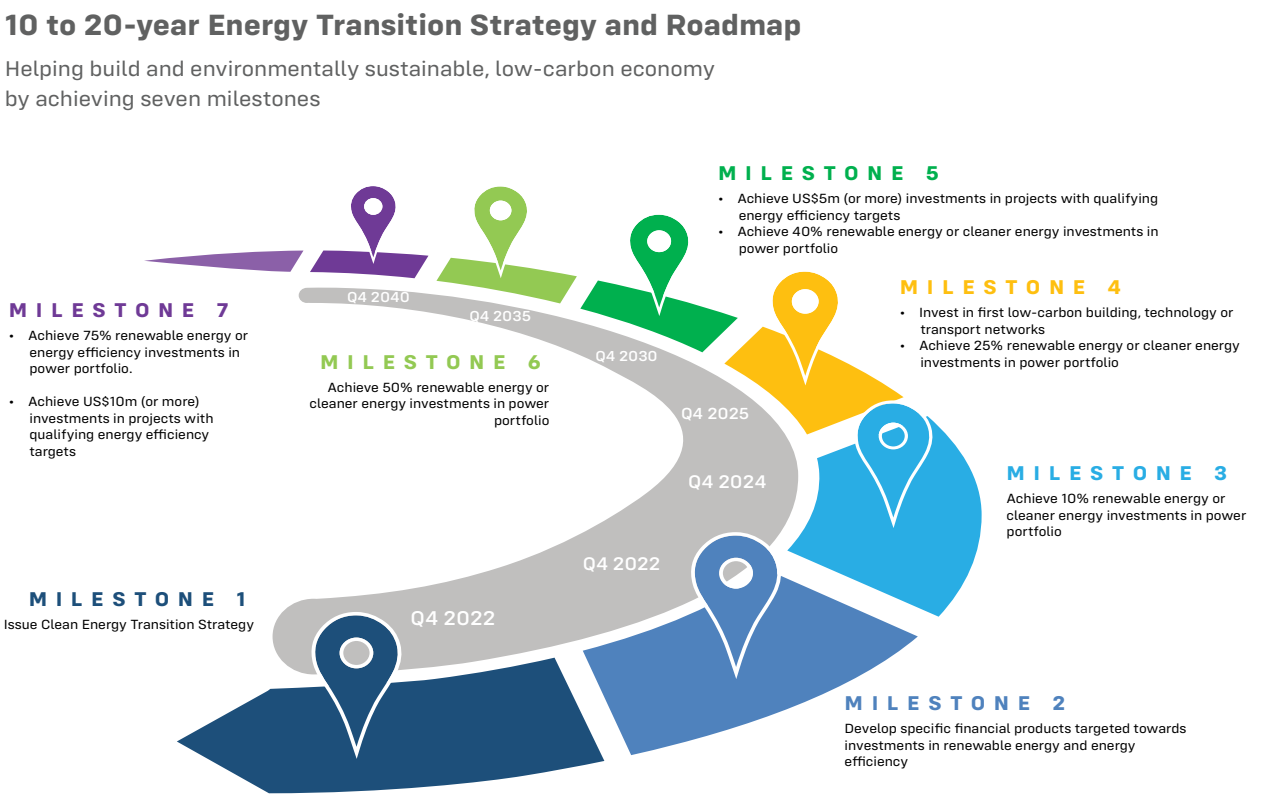


Table 4 provides a high-level roadmap, taking into consideration the different types of targets discussed above. InfraCredit will periodically update and refine this roadmap with more specific indicators and targets, based on our objectives and the objectives of their funders. The timeframe is proposed to match the revision of NDCs every 5 years.

Table 4 Overview of roadmap of InfraCredit's Clean Energy Transition

Timeframe	Context	Milestones and targets
Immediate (2022)	InfraCredit has committed to not supporting misaligned projects. The strategy formalises this commitment. In addition, the strategy will provide a timeline for the evolution of their project portfolio through the transition period. Ambitions will increase over time in terms of increasing share of aligned over transitional projects, or more stringent caps on emissions intensity of portfolio. Finally, InfraCredit's existing guarantee mechanism is not well suited for a variety of small-scale projects that are critical for the energy transition. InfraCredit is committed to developing new funds that are better adapted to this type of investments.	• Issuing InfraCredit's Clean Energy Transition Strategy • Defining baseline and time-bound targets (e.g., share of aligned projects, tonnes of CO2 emitted by projects financed by InfraCredit, or emissions intensity of portfolio (tCO2e/mUSD)[27] • No misaligned investments to enter portfolio • Develop new fund(s) adapted to clean energy transition projects
Short term (2022-25)	The NDC update will be released in 2021 with increased ambitions and costed investment requirements for the public and private sector. The Presidential Power Initiative (25 GW by 2025) will require significant acceleration of investments in all types of power supply. InfraCredit will play a significant role in unlocking finance for investments in the NDC, such as renewables, gas-fired power plants and other downstream gas investments promoted by the National Gas Expansion Programme, hybrid mini-grids and off-grid energy, water and waste projects, etc. The share of transitional projects in this period is expected to be important.	• At least [up to 25%] of new investments (in number of projects) should be Paris-aligned[28] (as opposed to transitional) • Cap on emissions intensity of portfolio (e.g., tCO2e/mUSD) to be determined • First transactions in new sectors (solar PV, mini-grids, vehicular gas, LPG for cooking, affordable housing, water and waste, etc) • Investment amount targets to be determined based on NDC update
Medium term (2025-30)	Updated NDC with increased ambitions expected in 2025. The objective of achieving universal access to electricity by 2030 will require acceleration of investments in decentralised power supply (gas, hybrid and off-grid solar). The objective of ending gas flaring by 2030 will require continued investments in a variety of new gas markets for (transportation, cooking, feedstock for industrial application).	• The majority of new investments [up to 50%] (in number of projects) entering InfraCredit's portfolio will be aligned[29] • Cap on emissions intensity of portfolio (e.g., tCO2e/mUSD) to be determined • Actual investment amounts to be determined based on NDC update

27 Carbon intensity of portfolio calculated as the InfraCredit attributed GHG emissions in a typical full year of operation of all investments financially closed in the year, divided by the amount ($m) invested. The initial cap can be set based on current portfolio and indicative pipeline.

28 This projection is subject to the availability of blended finance and technical assistance funds to make the opportunities commercially viable and economically scalable.

29 Ibid

Timeframe	Context	Milestones and targets
	InfraCredit will continue to play a significant role in supporting investments required to achieve the NDCs, both linked to climate change mitigation and adaptation. The share of aligned (over transitional) investments will be higher in this period, with a more stringent cap on portfolio emissions intensity.	
Long term (beyond 2030)	While there is no commitment of the Nigerian government today to reach net zero by 2050, it is expected that climate change mitigation actions will be scaled significantly. InfraCredit will only invest in aligned projects. Subject to availability of blended finance and technical assistance, no new transitional projects will enter the pipeline, unless there is a very strong justification, such as significant value for decarbonisation (e.g., LPG for cooking to avoid deforestation) and no viable alternatives (e.g., electrification of cooking not feasible/ widespread).	Only aligned investments to enter portfolio, with very limited exceptions[30] Cap on emissions intensity of portfolio (e.g., tCO2e/mUSD) (expected to be close to zero for new investments) Actual investment amounts to be determined based on NDC update

Conclusions

Mobilising capital on a much larger scale to achieve energy transition targets will require a dramatic increase in and enhanced role for donors, international and development finance institutions working alongside the private sector intermediaries like InfraCredit, which will be critical to catalyse this investment. Affordability and accessibility are key to ensuring clean energy transitions are people-centred and inclusive. To achieve this, smart use of public finance will need to come with much more private capital, and blended finance is critical to attract private investment. Unlocking blended finance to the required scale demands InfraCredit actively explores a range of financing instruments and approaches, with first loss risk capital from donors and DFIs playing a critical role.

The investment opportunities identified in this Strategy and Roadmap will be incorporated into InfraCredit's deal origination strategy (how to assess and bring in new deals) and in working with existing clients (what changes within existing portfolio can help align with transition, such fuel transition for existing investments). The decision trees will be applied to existing investments and for the onboarding of new deals. Demonstration deals in areas that are new to Nigeria (e.g., off-grid renewables and alternative fuel vehicles) will allow the development of new markets aligned with the Paris Agreement and to set more ambitious targets for mobilisation of capital in certain sectors/ for certain project types.

This strategy and roadmap will be reviewed periodically, to reflect increased ambitions of Nigeria's NDCs every five years, the objectives of InfraCredit's funders, as well as international trends in climate change mitigation and adaptation.

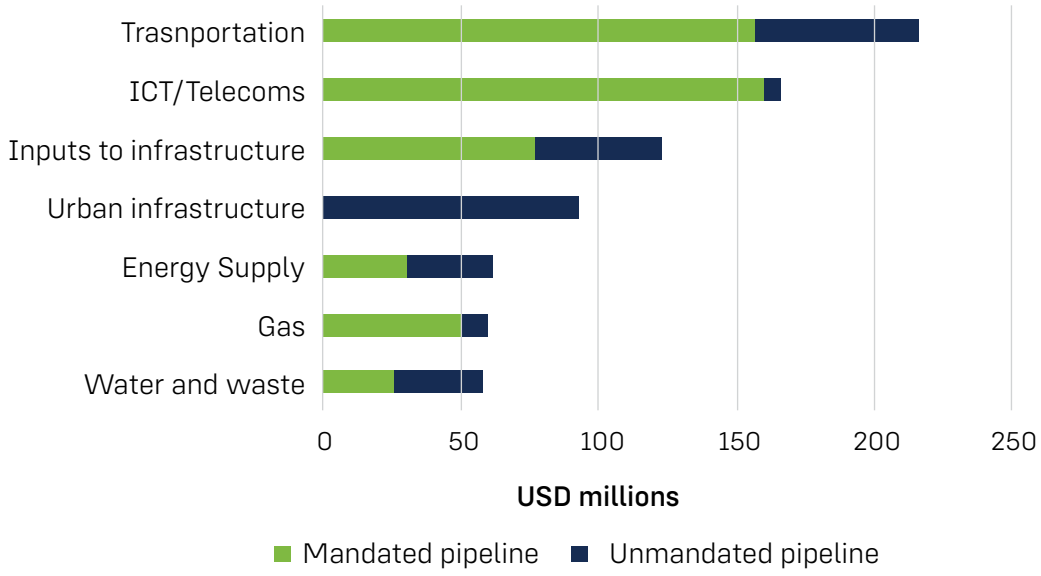
30 This target will reflect development needs and the prevailing market conditions, in addition to considerations of availability of blended finance and technical assistance to support mostly Paris-aligned projects. Also, we aim achieving net zero emissions through maintaining a portfolio composition that balances emissions generated through gas projects and the offset accrued from mostly supporting RE investments.

InfraCredit Project Pipeline

Existing pipeline

As of December 2020, InfraCredit's pipeline of projects amounts to $773 million, of which $499m are mandated[31] deals and $275m are unmandated. The breakdown of investments by sector is presented in Figure 10.

Figure 10 InfraCredit's project pipeline by origin of deal (December 2020)



Source: Infracredit

About 50% of the mandated pipeline (ie, ~$250million) is targeted to reach financial closure by the end of 2021. All at the financing stage are expected to eventually close. Projects at the development stage have already had extensive due diligence. Figure 11 presents InfraCredit's project pipeline by stage of development.

31 Mandated by InfraCredit clients

Figure 11 InfraCredit's project pipeline by stage of development (December 2020)

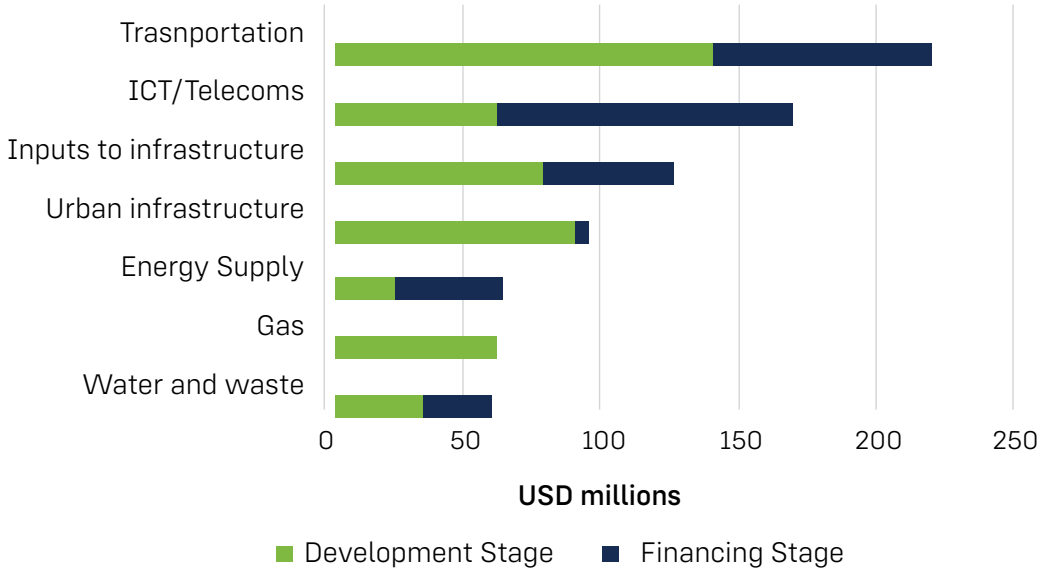


Table 5 Details of existing pipeline

Sector	Details
Transportation	62% of investment amount is in new roads targeted at alleviating traffic congestion. Other investments include ports, upgrading the vehicle fleet of a logistics company and a new bus terminal.
ICT/Telecoms	Most investments relate to the expansion of network infrastructure (towers and other equipment).
Inputs to infrastructure	Rollout of electricity meters, investment in an industrial park, and agro-industrial storage facilities.
Energy supply	Most investments (44%) are in gas-fired plants, followed by solar PV (35%). Both off-grid and grid-connected.
Gas infrastructure	Gas processing facilities for LNG, LPG and CNG.
Water and waste	Investments in water plant, treatment, and network; waste recycling and waste-to-energy projects.

In addition to the existing pipeline, InfraCredit's team has provided indications of other investments being considered. These include, for example:

- Support to the rolling out of embedded RE power generation, ie small-scale (~10 MW) solar PV
- Support to the financing of mini grids for rural electrification through financial aggregators/ intermediaries

A2 Policy context for climate change

Nigeria's Commitments under the Paris Agreement

The Paris Agreement calls for the world to achieve "a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty."

Nigeria has been active in the international process that led to this agreement for decades, becoming party to the UN Framework Convention on Climate Change in 1994, ratifying the Kyoto Protocol in 2004, implementing a number of clean development mechanism projects, and issuing its Climate Change Policy Response and Strategy in 2012. Under the Paris Agreement, Nigeria put forward its Intended Nationally Determined Contributions (INDC) with regards to GHG mitigation, summarised its National Adaptation Strategy and Plan of Action for Climate Change Nigeria (NASPA-CCN), and identified planned activities towards the implementation of the INDCs.

Nigeria's INDC (2015)

In 2015, Nigeria outlined its INDC as shown in Table 6. International support requirements were implied by statements of conditional and unconditional emissions reductions.

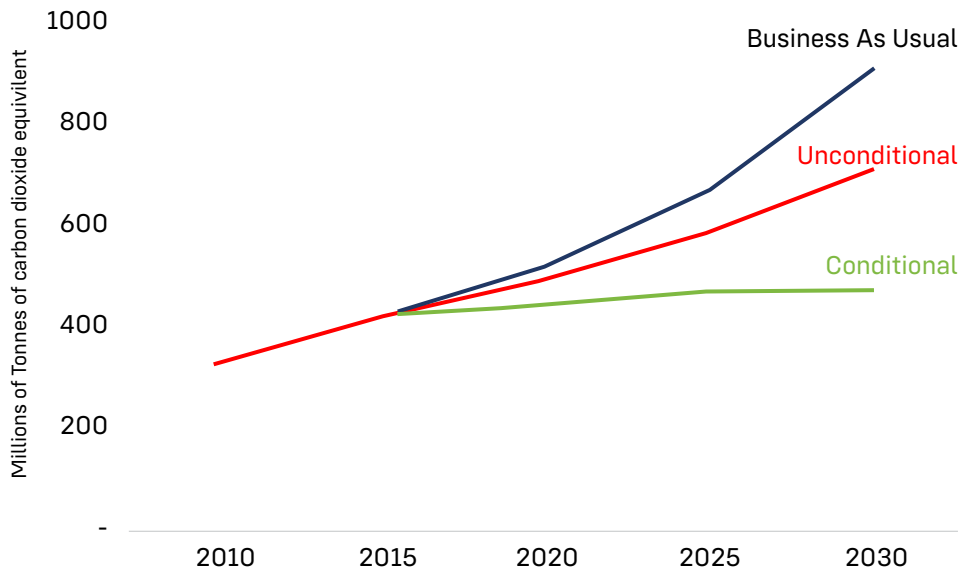
Table 6 Nigeria INDC (2015)

INDC by 2030	International NDC support required	Proposed measures
Ending gas flaring	**Unconditional**, net benefits positive although enforcement is problematic	Improved enforcement of gas flaring restrictions. Development of Gas-to-Power plants at gas flare sites.
13 GW of off-grid solar	**Unconditional**, with need to address poverty penalty for poor	Rural electrification will be driven by solar and other cost-efficient renewable solutions, replacing diesel generators.
Install efficient gas generators	**Conditional**, also removal of consumer and producer subsidies for fossil fuels	Multi-cycle power stations for new generation and refurbishment. Small-scale stations near a source of gas. Feeding industrial clusters with centralised gas supply. Replacing existing diesel generation with natural gas.
30% EE target	**Target of 20% unconditional**, assistance in addressing upfront measures is suggested.	Enforced policies to greatly improved efficiencies. Benchmarking against international best practice for industrial energy usage. New housing standards.
Move transport away from cars and planes	**Conditional**, highways can be financed through tolls, but system requires maintenance and investment.	Moving passengers and freight using high-speed rail instead of air. Establishing fuel efficiency standards and the use of LPG / CNG for buses and taxis and other urban transit solutions. Less carbon intensive upgrading if roads and toll roads. Blending 10% by volume of Fuel-Ethanol with Gasoline (E10) and 20% by volume of Biodiesel with Petroleum Diesel (B20) for Transportation Fuels.
Improve electricity grid	**Conditional**, at current rate of grid expansion many Nigerians will largely remain under-served.	Improving losses and expanding the distribution grid so all Nigerians have access to either of or off-grid power by 2030. Abandoning traditional grid paradigm in a way that reducing dependence on fossil fuels and addresses poverty penalty un-electrified Nigerians face in terms of cost, time, health impacts and power quality.
Investments in climate-smart agriculture and reforestation	**Conditional**, although cost assumed to be negligible due to external benefits.	Agroforestry, reduction in methane from livestock, and efficient cookstoves cited as main interventions. Under efficient cookstoves, ban on use of charcoal. Promotion of the use of gas cooking supports other goals.

Source: Nigeria INDC 2015

The overarching Nigerian target was a 20% reduction in greenhouse gas emissions by 2030 regardless of international support and a 45% reduction in GHG emissions by 2030 contingent on international support, compared to the business-as-usual scenario (see Figure 12).

Figure 12 Mitigation contributions (INDC 2015)



Source: Nigeria INDC 2015

Nigeria's updated NDC (2021)

Nigeria's updated NDC 2021 was submitted to the UNFCCC Secretariat in 2021. The key updates are described below:

- GHG Emission Reduction Targets: The NDC includes two key GHG emission reduction targets;
  - The unconditional 20% reduction of emissions from business-as-usual (BAU) projections;
  - The conditional reduction of emissions by 47%, dependent upon international financial and technological support
- Renewable Energy: The new NDC commits to sourcing 30% of electricity from renewables and installing 13 GW of off-grid renewable power (a stand-alone power system, often in remote locations, that is not connected to a national grid)
- Waste Sector: Introduction of a 10% methane emissions reduction target for the waste sector and proposes further nature-based initiatives, such as agroforestry and forest restoration
- Partnerships: The NDCs outlines the sectors where a capital injection will have the greatest multiplier effect – biofuel and renewables – and confirms a partnership with the UNDP to improve finance channels.

Access to finance is considered the biggest barrier to NDC implementation in Nigeria, exacerbated by a lack of national capacities for costing and resource mobilization. The financing needed to implement the updated NDC, particularly from private markets, is expected to be significant. However, private markets have recently been unable to provide significant amounts of finance towards low carbon measures for a number of reasons, in particular:

Thus, for Nigeria's NDCs to be realised it is expected that donor supported entities such as InfraCredit will have an essential role to play in unlocking private sector finance in order for Nigeria to achieve its NDCs.

Global 1.5 C and net zero goals

While the Paris Agreement does not explicitly set out net zero targets, signatories to the Paris Agreement pledge to limit global warming to well below 2°C, preferably 1.5°C. In support of this, PIDG is committed to supporting the countries in which it invests to contribute to the transition towards a global net zero carbon economy by 2050.

The rationale for this is detailed in the recent Intergovernmental Panel on Climate Change (IPCC) publication that reports that global warming of 1.5 °C above pre-industrial levels reports would likely result in severe and widespread risks related to extreme weather events, costal and fluvial flooding, crop yields, fisheries, and possible impacts on mangrove regions[32]. The recent IPCC special report detailed possible scenarios that would limit likely temperature increase under 1.5 °C. Scenarios explore the emissions reductions required by fossil fuels and industrial means with or without significant removals of CO2 emissions starting in 2030 through land use and bioenergy with CCS. Pathways limiting median warming to below 1.5°C in 2100, with a 50–67% probability of temporarily overshooting 1.5°C earlier in the century has a median year of achieving net zero of 2050 for CO2 emissions and 2068 for all Kyoto GHG emissions.

The IEA more recently used their energy models to analyse a global 'Net Zero by 2050' scenario. This scenario illustrated deep reductions needed by changes in behaviour, increases in EE and less carbon-intensive power. Globally, this case had a reduction of 309 Mtoe in global energy demand met by natural gas use from the period of 2019-2030. This would mean the global use of natural gas would reduce slightly while increasing EE measures such as gas flare utilisation[33].

Although these scenarios are not projections, they are indicative of the level of effort required globally to stabilise global warming. Consequently in 2020, more than 50 countries committed to achieve net-zero emissions by mid-century, and more than 100 stated they will announce such commitments soon. Notably, President Xi Jinping of China announced a net zero emissions target of no later than 2060 and the UK became the first major economy to sign into law the target of bringing all greenhouse gas emissions to net zero by 2050[34].

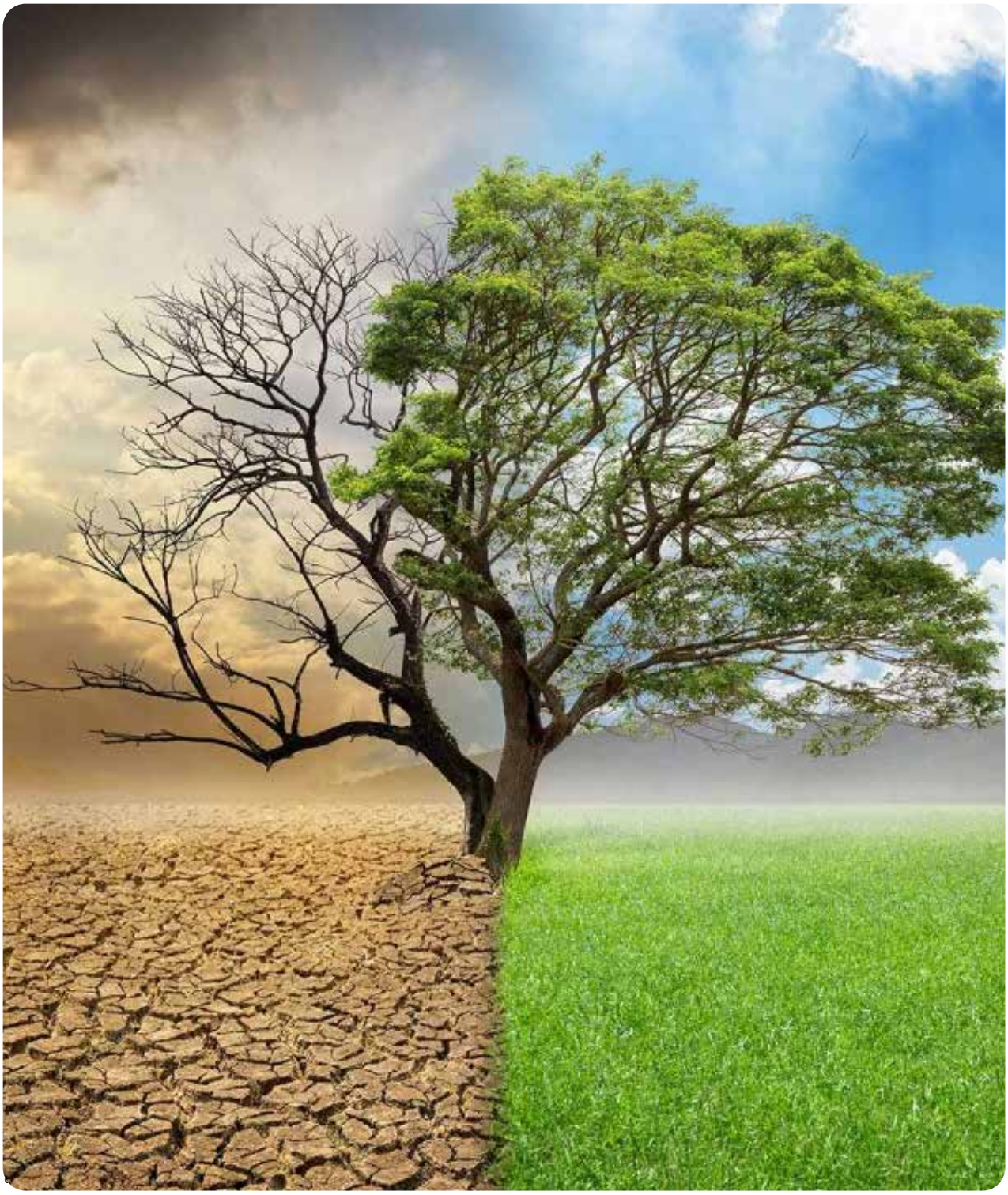
As the Paris Agreement requires that each country update their commitments every 5 years with greater ambitions, additional targets towards net zero emissions are expected in the

32 IPCC, 2018. Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty. V. Masson-Delmotte, P. Zhai, H.O. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

33 IEA (2020), World Energy Outlook 2020, IEA, Paris https://www.iea.org/reports/world-energy-outlook-2020

34 https://www.wri.org/blog/2020/12/how-to-advance-the-paris-climate-agreement

near term. If the initial intended NDC of all signatories to the Paris Agreement are implemented to their fullest extent, the emission cuts would likely limit the resulting temperature rise to around 2.7 degrees Celsius by 2100[35]. Thus, there is likely to be international pressure to take on more ambitious targets in the future and international support to countries who have demonstrated scalable ways to meet such targets.

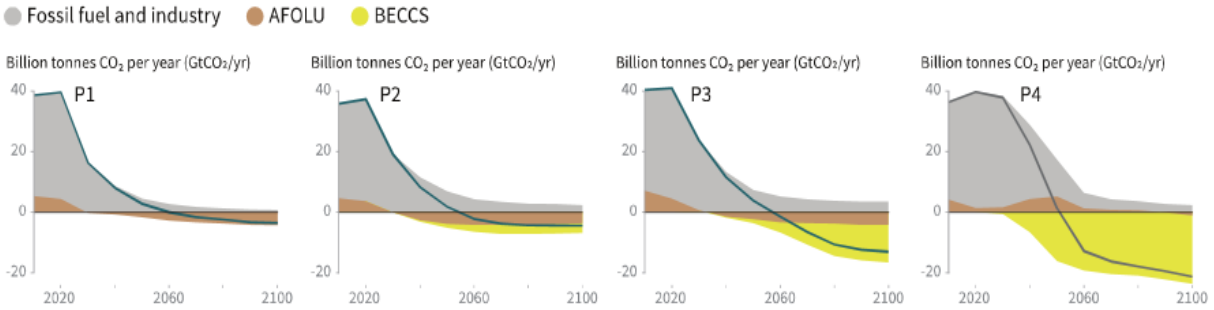


35 http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf

Characteristics of four illustrative model pathways

Different mitigation strategies can achieve the net emissions reductions that would be required to follow a pathway that limits global warming to 1.5°C with no or limited overshoot. All pathways use Carbon Dioxide Removal (CDR), but the amount varies across pathways, as do the relative contributions of Bioenergy with Carbon Capture and Storage (BECCS) and removals in the Agriculture, Forestry and Other Land Use (AFOLU) sector. This has implications for emissions and several other pathway characteristics.

Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

Global indicators	P1	P2	P3	P4	**Interquartile range**
Pathway classification	No or limited overshoot	No or limited overshoot	No or limited overshoot	Higher overshoot	No or limited overshoot
CO_2 emission change in 2030 (% rel to 2010)	-58	-47	-41	4	(-58,-40)
└ in 2050 (% rel to 2010)	-93	-95	-91	-97	(-107,-94)
Kyoto-GHG emissions in 2030 (% rel to 2010)*	-50	-49	-35	-2	(-51,-39)
└ in 2050 (% rel to 2010)	-82	-89	-78	-80	(-93,-81)
*Final energy demand** in 2030 (% rel to 2010)*	-15	-5	17	39	(-12,7)
└ in 2050 (% rel to 2010)	-32	2	21	44	(-11,22)
Renewable share in electricity in 2030 (%)	60	58	48	25	(47,65)
└ in 2050 (%)	77	81	63	70	(69,86)
Primary energy from coal in 2030 (% rel to 2010)	-78	-61	-75	-59	(-78, -59)
└ in 2050 (% rel to 2010)	-97	-77	-73	-97	(-95, -74)
from oil in 2030 (% rel to 2010)	-37	-13	-3	86	(-34,3)
└ in 2050 (% rel to 2010)	-87	-50	-81	-32	(-78,-31)
from gas in 2030 (% rel to 2010)	-25	-20	33	37	(-26,21)
└ in 2050 (% rel to 2010)	-74	-53	21	-48	(-56,6)
from nuclear in 2030 (% rel to 2010)	59	83	98	106	(44,102)
└ in 2050 (% rel to 2010)	150	98	501	468	(91,190)
from biomass in 2030 (% rel to 2010)	-11	0	36	-1	(29,80)
└ in 2050 (% rel to 2010)	-16	49	121	418	(123,261)
from non-biomass renewables in 2030 (% rel to 2010)	430	470	315	110	(245,436)
└ in 2050 (% rel to 2010)	833	1327	878	1137	(576,1299)
Cumulative CCS until 2100 ($GtCO_2$)	0	348	687	1218	(550,1017)
└ of which BECCS ($GtCO_2$)	0	151	414	1191	(364,662)
Land area of bioenergy crops in 2050 (million km^2)	0.2	0.9	2.8	7.2	(1.5,3.2)
Agricultural CH_4 emissions in 2030 (% rel to 2010)	-24	-48	1	14	(-30,-11)
in 2050 (% rel to 2010)	-33	-69	-23	2	(-47,-24)
Agricultural N_2O emissions in 2030 (% rel to 2010)	5	-26	15	3	(-21,3)
in 2050 (% rel to 2010)	6	-26	0	39	(-26,1)

NOTE: Indicators have been selected to show global trends identified by the Chapter 2 assessment. National and sectoral characteristics can differ substantially from the global trends shown above.

** Kyoto-gas emissions are based on IPCC Second Assessment Report GWP-100*
*** Changes in energy demand are associated with improvements in energy efficiency and behaviour change*

Table 7 Climate change adaptation considerations

InfraCredit investment sectors	Climate change adaptation considerations
Energy supply and distribution infrastructure	• Include increased protective margins in construction and placement of energy infrastructure (ie, higher standards and specifications). • Undertake risk assessment & risk reduction measures to increase resilience of the energy sector. • Strengthen existing energy infrastructure, in part through early efforts to identify and implement all possible 'no regrets' actions. • Develop and diversify secure energy backup systems to ensure both civil society and security forces have access to emergency energy supply. • Expand sustainable energy sources and decentralise transmission to reduce vulnerability of energy infrastructure to climate impacts.
Waste management infrastructure	Reinforce programmes to build and maintain wastewater and solid waste management facilities.
Transportation and Telecommunications/ICT	• Include increased protective margins in construction and placement of transportation and communications infrastructure (ie, higher standards and specifications). • Undertake risk assessment and risk reduction measures to increase the resilience of the transportation and communication sectors. • Strengthen existing transportation and communications infrastructure, in part through early efforts to identify and implement all possible 'no regrets' actions. • Develop and diversify secure communication backup systems to ensure both civil society and security forces have access to emergency communication methods.
Urban infrastructure (housing, hospitals, education), and	• Intensify programmes to survey water quality and quantity for both ground and surface water. • Implement programmes to sustainably extend and improve water supply and water management infrastructure. • Strengthen disease prevention and treatment for those diseases expected to increase because of climate change. • Promote and facilitate the adoption of practices and technologies that reduce exposure and health impacts from extreme heat. • Establish early warning and health surveillance programmes. Develop climate change adaptation action plans for urban areas, particularly those at greatest risk. • Assist communities to reduce vulnerability through participatory planning of land use & housing. • Discourage building/urban encroachment into vulnerable areas, high risk zones & low-lying areas. • Discourage housing and settlement practices that are maladaptive in the face of climate change.

InfraCredit investment sectors	Climate change adaptation considerations
Agricultural infrastructure	• 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). • 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). • 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.

For almost a decade, Lagos city and state has been at the forefront of establishing state-led climate policies and in particular adaptation strategies. The state has a significant amount of investment vulnerable to climate change impacts. Higher temperatures that lead to one metre rise in relative sea level would results in 18,400 km2 of Nigeria's coastal land area will be submerge and increased insurance coverage for coastal infrastructure assets. As Lagos is where most of the debt is also invested, bond holders have significant interest in what policies it chooses to address climate change adaptation.

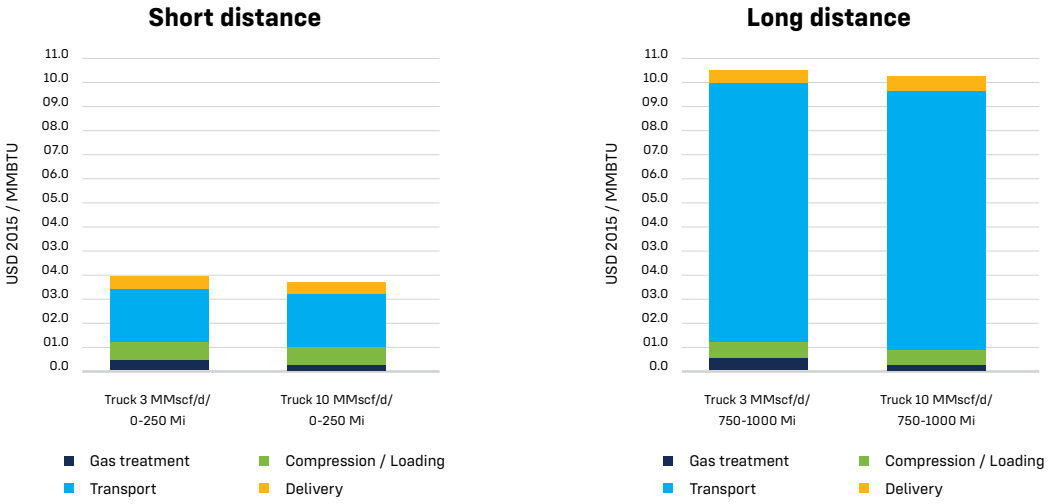
Currently, development of pipeline of adaptation project/development of financial cost for adaptation measures with the sectoral action plan for Nigeria is being supported by the UNEP, in conjunction with UNIDO, the implementing partners for the Climate Technology Centre and Network (CTCN). The CTCN is expected to provide technical assistance to aid development of a comprehensive Technology Needs Assessment and action plan aimed at conducting a categorisation and prioritisation of technologies that will comply with Nigeria's NDCs.

A3 NGV associated infrastructure investment opportunities

CNG

The investment required in building CNG infrastructure is dependent on the distance of the pumps from the gas transmission or distribution network. Fuel pumps do not typically need to be collocated close to a gas distribution network, and therefore CNG supply will likely rely on truck transportation from the closest pipeline exit point to the station (or the creation of a new entry point). Both options are expensive, and analysis shows that transportation is the most significant determinant of final cost.

*Figure 13 Short distance and long-distance value chains for CNG**



Source: CNG for commercialisation of small volumes of associated gas, World Bank 2015

** CNG is generally less suited to larger gas volumes and longer distances due to the large CNG transportation requirement (ships, barges or trucks). The large scale of the CNG loading facilities also required for large gas volumes reinforces this conclusion.*

Storage of CNG once it reaches the pump are determined by the type of CNG station. Some are fast fill whereas other are timed fill (slower fill). Most non-fleet stations servicing ordinary customers will need to be fast fill to avoid time spent at station and will therefore require significant pressurised storage reserves or fast compression capabilities. Finally, additional costs are required to adapt the fuelling bays to the natural gas – these costs can be upwards of $5000 per bay. One estimate suggests that a large retail conversion would cost between $1.2 million to $1.8 million per station[36]

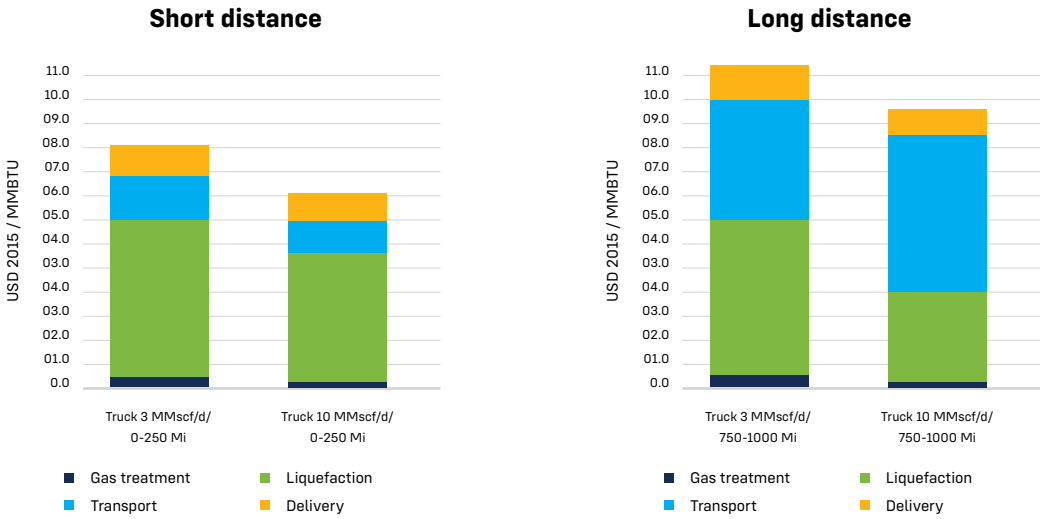
LNG

LNG and LPG are more energy dense than CNG. Therefore, greater energy volumes can be transported using land-based transport than an equivalent amount of CNG on a volume basis.

36 Costs Associated With Compressed Natural Gas Vehicle Fuelling Infrastructure, US Department of Energy 2014

However, LNG requires significant cold storage which involves the cost of the initial storage container but also any additional power required to keep the temperature low. It is unlikely that many retail petrol pumps will be converted to LNG because these would typically only involve large vehicles which are part of corporate fleets. The cost of a truck and truck loading facilities is estimated to be $400,000[37] per truck and an estimated $ 5.5 million on truck unloading facilities.

*Figure 14 Short distance and long-distance value chains for LNG**



Source: LNG for commercialisation of small volumes of associated gas, World Bank 2015

** These figures are for small scale LNG. While large-scale LNG may see a reduction in some costs, there proportional costs are likely to be the same with the major limit being the size of trucks – other efficiencies eg, reduction in per unit treatment as is illustrated in the increase form 3 MMscf/d to 10 MMscf/d*

Typical investments in an LNG pump involve:

- Offloading systems for LNG
- Cryogenic storage (cold storage)
- LNG pumping and condition system

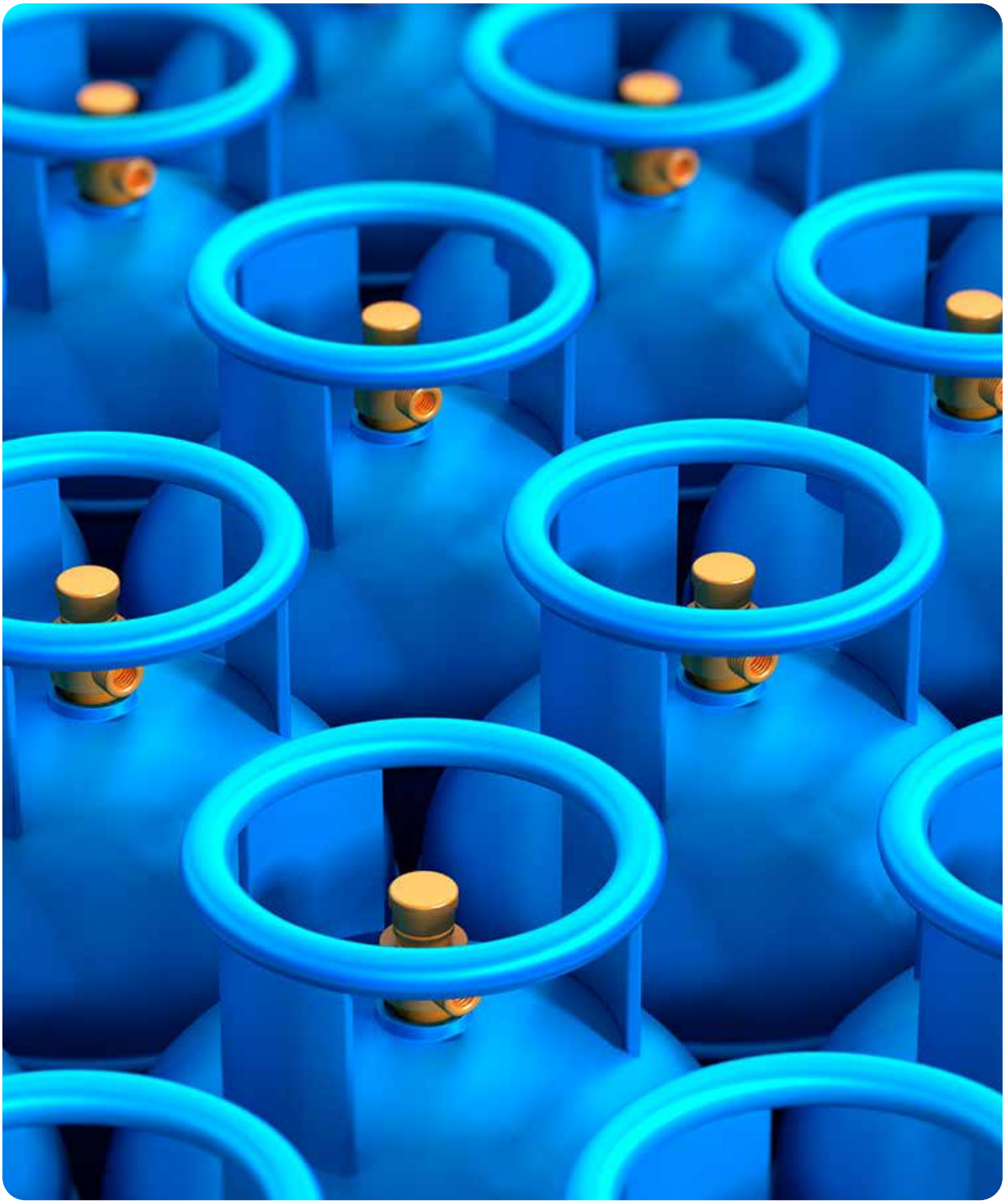
The Alternative Fuels Data Center (AFDC) notes that it is extremely difficult to estimate the investment required in LNG stations due to the highly variable nature of the station business model. The cost of storage depends on the size and can easily be upwards of $50 million. The cost of the pump delivery unit can range from one to several million dollars[38].

37 Cost estimates provided from Interior Gas Utility Fairbanks Gas Distribution Advancement Project Task 3: LNG Storage Tank Cost Analysis available

38 https://afdc.energy.gov/fuels/natural_gas_infrastructure.html

LPG

Nigerian government policy on LPG is articulated and indicates that it expects 1 million metric tons (MT) of LPG to be used in automobile and transport sector. This is greater than the overall LPG used by Nigeria in 201939. Transport of LPG is cheaper than CNG since it is denser or LNG since it doesn't require cold storage (though it does require pressurised tanks). The cost of trucks is approximately half that of LNG trucks, and used trucks can be found for cheaper40. The associated costs for the delivery infrastructure at the pump level are very similar to adaptation costs for CNG.



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