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REPORT ON TRANSPORT I&FF ASSESSMENT

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ABBREVIATIONS AND ACRONYMS

Federal Airports Authority of Nigeria (FAAN)

Federal Road Safety Commission (FRSC)

National Automotive Design and Development Council of Nigeria (NADDC)

National Inland Waterways Authority (NIWA)

Nigeria Bureau of Statistics (NBS)

Nigerian Institute of Transport Technology (NITT)

Nigerian Maritime Administration and Safety Agency (NIMASA)

Nigerian Shippers' Council (NSC)

Nigeria Customs Service (NCS)

Standard Organization of Nigeria (SON)

Security Exchange Commission (SEC)

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EXECUTIVE SUMMARY

The I&FF analysis constitutes three major elements namely: Investment Flow (IF), Financial Flow (FF) and Operations and Maintenance (O&M). Investment on fossil fuel between 2015 and as projected to 2030 under the business as usual is estimated to be in the region of US$ 153 billion. This represents about 231 billion litres of consumptions from 2015 and as projected up to 2030.

"Nigeria's total GHG in 2014 was 492.44 MtCO2e[1]. This represents a fraction above a percent of global GHG emissions. In Nigeria, 38.2 percent of GHG emissions came from the land-use change and forestry sector, followed by the energy, waste, agriculture and the industrial processes sector, which contribute 32.6%, 14.0%, 13.0% and 2.1% respectively."[2]

Nigeria's GHG emissions increased by 25% (98.22 MtCO2e) from 1990 to 2014.[3] While between 2009 and 2014 the nation's contribution to GHG emission increased from 170Mt to 190Mt representing 12% increase. However, between 1990 and 2014 the figure remains the same (i.e. 190Mt). Various factors may be responsible for such an uncommon development. These may not be unconnected to the fact that despite growth in the economy, development has been somewhat erratic, unplanned, and often inconsistent with some of the most basic of macro and microeconomic factors. Percentage wise, Nigeria's contribution to GHG emission may appear insignificant being just a trivial 1.01%. Yet, in terms of volume the figure is huge (i.e. 190Mt). As such, proactive measures in terms of adaptation and mitigation should be a priority.

[1] https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID_Nigeria%20GHG%20Emissions%20Factsheet.pdf

[2] https://businessday.ng/columnist/article/adaptation-of-nigerias-transportation-sector-to-climate-change/

[3] https://www.climatewatchdata.org/ghg-emissions?regions=WORLD%2CNGA&sectors=bunker-fuels%2Cland-use-change-and-forestry

CHAPTER ONE

1.0 INTRODUCTION

Nigeria became a party to the United Nations Framework Convention on Climate Change (UNFCCC) in 1994. It submitted its First National Communication (FNC) in 2003 and ratified its Kyoto protocol in 2004. In 2012, the Federal Executive Council approved Nigeria Climate Change Policy Response and Strategy. It went a step further to submit its Second National Communication in February 2014. In 2015, Nigeria INDC was approved by the President and Commander in Chief of the Federal Republic of Nigeria.

The objective of the INDC is a departure from business as usual in favour of persistent and sustained mitigation and adaptation measures. The duration period for the implementation of INDC was slated to be between 2015 and 2030.

1.1 Objectives

The overall aim of assessment of the I&FF in the Transport sector is to

- Strengthen the national capacity of Nigeria towards assessing and developing sustainable policy options and by implication, funding structure for addressing the NDC Sector Plans and foster economic growth, development, and Low Emission Development Strategy (LEDs).
- Provide comprehensive approaches to analyze, restructure and make national investments more efficient to support climate change adaptation and mitigation. It is anticipated that the assessments could also contribute to advancing national climate change strategies by engaging line ministries and encouraging an enabling environment.

1.2 Background

At COP 21 in Paris, on 12 December 2015, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. The Paris Agreement builds upon the Convention and – for the first time – brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with ***enhanced support to assist developing countries*** to do so. As such, it charts a new course in the global climate effort.

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement aims to increase the ability of countries to deal with the impacts of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway. To reach these ambitious goals, appropriate mobilization and provision of financial resources, a new technology framework and enhanced capacity-building is to be put in place, thus supporting action by developing countries and the most vulnerable countries, in line with their own national objectives. The Agreement also provides for an enhanced transparency framework for action and support.

The Paris Agreement requires all Parties to put forward their best efforts through "nationally determined contributions" (NDC's) and to strengthen these efforts in the years ahead. This includes requirements that all

Parties report regularly on their emissions and on their implementation efforts. There will also be a global stock take every 5 years to assess the collective progress towards achieving the purpose of the agreement and to inform further individual actions by Parties.

The Paris Agreement opened for signature on 22 April 2016 – Earth Day – at UN Headquarters in New York. It entered into force on 4 November 2016, 30 days after the so-called "double threshold" (ratification by 55 countries that account for at least 55% of global emissions) had been met. Since then, more countries have ratified and continue to ratify the Agreement, reaching a total of 189 Parties so far[i].

1.2.1 PROJECT BACKGROUND

In 2018, Nigeria received support from UNDP's NDC Support Program to advance the implementation of her INDC. As one of UNDP's flagship programs, training on assessment of investment and financial flows (I&FF) for the selected sectors (Agriculture, Energy, Industry, Oil and Gas, and **Transport)** was conducted with the intent of having a better understanding of the future financial needs of these sectors in implementing climate mitigation and adaptation actions and to identify policies and incentives to implement these actions. It is also anticipated that I&FF assessments will contribute to advancing national climate change strategies by engaging line and relevant MDAs as well as encouraging an enabling environment for the private sector, local and foreign investments.

1.2.2 TRANSPORT SECTOR BACKGROUND

Transportation, a derived demand, is the movement of goods, services, and persons from place to place and the various means by which such movement is accomplished. The growth of the need, ability, and capacity to transport large quantities of goods or numbers of people over long distances at high speeds in comfort and safety has been an index of civilization and, of technological progress.

Mobility is fundamental to economic and social activities, including commuting, manufacturing, or supplying energy and transport systems composed of infrastructures, modes and terminals are so embedded in the socio-economic life of individuals, institutions, and corporations that they may often become "unconsciously' invisible to the consumer.

Mobility clearly is essential to economic growth, but in our carbon-based world moving people from place to place exacts a steep price.

1.2.3 THE TRANSPORT SECTOR AND CLIMATE CHANGE

The Transportation Sector is powered/fueled largely by fossil fuels hence the transportation sector's huge contribution to harmful energy-related emissions. Concentrations of CO_2 have risen steadily since the early 1980s[ii], except for the period beginning with the start of the last recession in late 2007.

Globally, the picture is similar to the above, and in its most recent report on climate change, the Intergovernmental Panel on Climate Change (IPCC) in 2014 offered a stark forecast: ***by 2050, global emissions of greenhouse gases from transportation could grow to about 12 billion tons of CO_2e annually – unless there are aggressive and sustained changes in how humans get around***. Globally, the transportation sector in 2010 – as reported then by IPCC – was responsible for about 23 percent of total energy-related CO_2 emissions worldwide.

Transportation and the resultant carbon emitted make for a big and unwieldy topic. But reviewing a few key areas can help improve the understanding of the challenges ahead. Transport has been traditionally looked upon as a challenge in terms of reducing greenhouse gas emissions, and a lot of effort has been rightly directed at that issue.

In recent years, however, with the Sustainable Development Goals and the Paris Climate Agreement, adaptation of transport to the future climate, once a 'poor relation' in terms of climate change response, is increasingly being recognised as vital to the continued success of mobility and global trade and development.

What is new is the growing realization that individual transport modes and their infrastructure - seaports, airports, rail routes, roads, inland waterways - have a collective interdependence on each other.

Transport is a '*system of systems*' and resilience of each transport mode to the impact of future weather patterns along the entire network of global supply chains warrants consideration so that impacts, risks and vulnerabilities across transport modes are identified and addressed.

1.2.4 Impact of Covid-19 on Emissions

At the April 2020 peak of the Covid-19 Pandemic, regions responsible for ~90% of global fossil CO2 emissions were under some level of confinement[iii]. Aviation decreased by 75%, surface transport by 50%, power generation by 15%, industry uncertain but ~35%, small increase in residential buildings of 5%.

The global lockdown induced large drop in emissions, 3-months 8% and peak drop 17% unprecedented, dropping to levels last observed in 2006. At their peak, emissions in individual countries decreased by ~27%. Emissions from surface transport accounted for almost half (43%) of the decrease, and aviation 12%.

In Nigeria, the multi-stage lockdown occasioned varying levels of aviation and ground transport activities shutdown with the only ***legal*** movements at some point being of essential services.

1.2.5 Previous Analyses Utilized

For climate related policies to be sustainably resilient, effective, and efficient in playing a decisive role towards adaptation and mitigation measures, having access to relevant historical data are paramount. This makes the initiatives specific, focused and result oriented. This in turn goes a long way in determining its success.

In the light of the challenges faced in accessing the much-needed historical data from relevant government agencies, we opted for publicly available data from the websites of some renown and reputable (including but not limited to government) organisations. This was done as way to overcome the data collation challenges directly from government institutions while at the same time ensuring the quality of the data is guaranteed.

1.2.6 Stakeholder Environment: Institutional Arrangements and Collaborations

The project was implemented by the Department of Climate Change (DCC) of the Federal Ministry of Environment which is the National Focal Point (NFP) for climate change. The DCC provided policy guidance and maintained overall oversight of the project through the Project Lead. The Program had a 16-member Technical Working Group (TWG) drawn from ministries and private sector. In addition, Five Team leaders were assigned to coordinate the five NDC sectors namely Agriculture, Oil and Gas, **Transport**, Industry and

Power. Each sector comprised of Data analysts, Economist and Finance experts, Climate experts and Institutional support.

Our identified stakeholders for the purpose of engagement and key data sources include the following (batched):

1. Federal Ministries of Transport, Works, Environment, and Finance, Budget and National Planning; Nigeria Bureau of Statistics (NBS); Federal Airports Authority of Nigeria (FAAN); Federal Road Safety Commission (FRSC); Nigerian Institute of Transport Technology (NITT); National Inland Waterways Authority (NIWA); Nigerian Maritime Administration and Safety Agency (NIMASA); Nigerian Shippers' Council; Nigeria Customs Service (NCS); and others such as Standard Organization of Nigeria (SON), Customs, SEC; National Automotive Design and Development Council of Nigeria (NADDC); etc.

2. Development Multilateral Agencies, Banks and Partners (AfDB, World Bank, The Infrastructure Bank Plc, UNDP, DfID, GIZ, UNIDO, etc., regarding their works in the transport sector within the defined time scale); National and Global Transport Data Organizations; etc.

3. Organized Private Sector: Dangote (Benue, Obajana and Lagos), BUA (Sokoto, Okpella & Lagos), Lafarge and Ashaka Cement Companies; Cement Manufacturers of Nigeria [CEMAN]; Fertilizer Producers and Suppliers Association of Nigeria [FEPSAN]; Major Transport Operators State-owned (e.g. LAGBUS, TRACAS, Benue, etc.) and private sector (e.g. Chisco, ABC, etc.); Manufacturers Association of Nigeria [MAN]; National Union of Road Transport Workers (NURTW); Nigeria Association of Chambers of Commerce, Industry, Mines and Agriculture [NACCIMA]; Nigerian Association of Road Transport Owners (NARTO); Road Transport Employers Association of Nigeria (RTEAN); Relevant (vehicle, trucks, aircrafts, ferries etc.) Manufacturers/representatives; etc.

4. State Ministries or Departments of Transport; (Public) Works; Finance; etc. (as the case may be) in Adamawa, Kwara, Lagos, Ogun, Oyo, Edo, Rivers, Kogi, Kano, Kaduna, Sokoto, Niger etc. States and FCT; State Transport Management Agencies e.g. LAMATA.

1.2.7 Established and Requested Datasets

The transport sub-sectors (passenger and freight) data gathering attempts were aimed at obtaining data considered essential to the success of this assignment as follows:

1. **Roads**: Infrastructure (new and improvements); system (improvements e. g. Terminals etc.); Technology (construction/improvements, system management; demand management, traffic management, etc.) targeting initiatives and funding by government (Federal and States in the immediate term); development/aid organizations; private sector organizations, operating in the road passenger and freight space.
2. **Rail:** Infrastructure (new and improvements); system (improvements e. g. Terminals etc); Technology (construction/improvements, system management; demand management, etc.) targeting initiatives and funding by government (Federal and States in the immediate term), development/aid organizations, private sector organizations operating in the rail passenger and freight space.
3. **Civil Aviation:** Infrastructure (new and improvements); system (improvements eg. Terminals etc.); Technology (construction/improvements, system management; demand management, etc) targeting initiatives and funding by government (Federal and States in the immediate term), development/aid organizations, private sector organizations operating in the aviation passenger and freight space.

5. **Water-borne:** Infrastructure (new and improvements); system (improvements eg. Terminals etc.); Technology (construction/improvements, system management; demand management, etc.) targeting initiatives and funding by government (Federal and States in the immediate term), development/aid organizations, private sector organizations, operating in the water-borne passenger and freight space.

Though spirited efforts were made to cash in on the briefings during the seminars and workshops preparatory to the official kick off the activities of the transport sector and obtain data on strategic planning and financial management processes from the relevant MDAs, the budget of the Federal Ministry of Transport remains the most easily accessible and the **ONLY** document (that meets the crucial criteria of completeness) available to the team at this stage.

1.2.8 METHODOLOGY

The methodology and approach of the national assessment of I&FF mitigation followed the eight steps outlined.

1. **Establishing key assessment parameters**
   Key parameters were identified to:
   - Determine in detail the scope of the sector.
   - Identify the preliminary measures of mitigation.
   - Specify the period of evaluation and the reference year; and
   - Select an analytical approach in the methodological guide

2. **Compile historical** IF, FF, and O&M cost data, subsidy cost data (if included explicitly) and other input data for scenarios from 2007 – 2017.

3. **Describe baseline scenario**. Defining the baseline scenario is very important and it is the basis for determining the cost between 'business as usual' scenarios and the more efficient alternatives, the mitigation scenarios. To do this, existing plan and programmes had to be identified and projections developed for the outer years of the analysis period.

4. **Estimating the I&FF scenario in the baseline**.
   In this section of the framework approach the analysis involved:
   - Estimates of I&FF annually disaggregated by investment entity and funding source.
   - Estimates the O&M annually disaggregated by investment entity and funding source.
   - Estimate annual subsidy costs for each relevant investment type and for IF, FF, and O&M costs, if subsidies are included explicitly in the assessment.

5. **Defining potential mitigation scenario**
   This involved identifying the mitigating interventions for each sub-sector of the energy sector and listing them for each type of asset.

6. **Deriving detailed annual I&FF estimates of the mitigation scenario**
   This required:
   - Estimating annual changes, I&FF and EM required to implement mitigation scenario.
   - Estimating the annual IF, FF, and O&M costs, and subsidy costs, if included, explicitly, for mitigation scenario.
   - Estimating the annual IF and FF for each investment type, disaggregated by investment entity and funding source.

- Estimating the annual O&M costs for each IF, disaggregated by investment entity and funding source; and
- Estimating annual subsidy costs for each relevant investment type and for IF, FF, and O&M costs, if subsidies are included explicitly in the assessment.

7. Calculate the changes in IF, FF, and O&M costs, and in subsidy costs if included explicitly, needed to implement mitigation.

- Calculate changes in cumulative IF, FF, and O&M costs for all investment types.
- Calculate changes in annual IF, FF, and O&M costs for individual investment types, for individual sources of funds, and for all investment types and funding sources.
- If subsidies are included explicitly, consider calculating changes in cumulative and/or in annual subsidies for IF, FF, and O&M for each investment type and all investment types.

8. Assessing policy implications

These highlight the need to:

• Based on the necessary change determined, identify policies and incentives to induce the necessary change.

Integrate climate change in regional projects, regional and national strategy,

• Strengthen the capacities of all stakeholders
• Integrating these options in national reference
• Involve local entities proactively; give responsibility/empowerment to the people
• Develop activities that support the generation of income/revenue

It is expected that this national assessment of I&FF will increase greater awareness and understanding of future investments that address climate change as well as development priorities.

1.2.9 KEY TERMINOLOGIES

Scenario: A 'scenario' is an internally consistent and plausible characterization of future conditions over specified time.

Investment flow (IF): An "investment flow" (IF) is the capital cost of a new physical asset with a life of more than one year, such as the capital cost of a new power plant, a new automobile, a new household appliance or a new agricultural irrigation system. Investment flows are limited to new physical assets because such investments have climate change implications for the duration of the operating lives of the facilities and equipment purchased.

Financial flow (FF): A "financial flow" (FF) is an ongoing expenditure of programmatic measures; financial flows encompass expenditures other than those for expansion or installation of new physical assets. Examples of financial flows include expenditures for an agricultural extension program for farmers, a malaria prevention program to distribute mosquito nets, or the implementation of improved forest management techniques. These expenditures are "operation and maintenance" type costs, e.g., salaries and raw materials.

'Operation and Maintenance' (O&M) Costs: it is associated with physical assets purchased with investment flows and will have operation and maintenance (O&M) costs associated with them (i.e., ongoing fixed and variable costs such as salaries and raw materials). Operation and maintenance costs of new assets need to be included in I&FF assessments because these costs can vary considerably among investment flow types and can have a significant effect on the total cost of an investment over its lifetime. For example, O&M costs are a much greater share of total costs (capital costs plus O&M costs) for gas-fired electricity generation than

photovoltaic electricity generation. O&M costs include the following categories of costs: Salaries or wages of personnel, Fuel costs such as power and/or fuel for operations, fuel for production, Public utilities such as telephone service, Internet connectivity, etc., Raw materials, Maintenance and/or leasing of equipment, Office supplies and consumables, Advertising, insurance, etc.

Investment Entity

An "investment entity" is the body or thing making the investment in the asset. The sources of the I&FF are the origins of the funds invested by the investment entities, e.g., domestic equity, foreign debt, domestic subsidies, foreign aid. These are described below for each investment entity.

Households

Households are individuals or groups of individuals (e.g., families) who act as one unit financially. Households invest in assets, such as homes, farms, vehicles, and facilities for small unincorporated businesses. All of their investment funds, which include equity (savings, remittances by relatives in foreign countries), debt (loans from friends, relatives, or financial institutions), and government support in the form of subsidies (e.g., rebates, tax deductions, or tax credits on purchases), are assumed to be domestic to simplify the assessment of I&FF.

Corporations

Corporations include both financial corporations and non-financial corporations and can be either for profit or not-for-profit.

Governments

Governments are the national, provincial, state, and local governments of a country. Financial and non-financial corporations owned wholly or in part by governments, such as public universities and research institutions, and publicly held oil companies, utilities, and water authorities, are included in this category.

Table 1: Taxonomy of investment entities and sources[4] of I&FF

Investment Entity	Source of I&FF Funds	
Households	Domestic	Equity and debt
Corporations	Domestic	Domestic equity (including internal cash flow)
		Domestic borrowing (bonds and loans)
	Foreign	Foreign direct investment (FDI)
		Foreign borrowing (loans)
		Foreign aid (ODA)[A]
Government	Domestic	Domestic funds (budgetary)
	Foreign	Foreign borrowing (bonds and loans)
		Bilateral foreign aid (bilateral ODA)
		Multilateral foreign aid (multilateral ODA)

[4] An official development assistance (ODA) provided to private corporations is primarily foreign aid that is given to nongovernmental organizations (NGOs).

Mitigation Scenario
The mitigation scenario includes measures to mitigate GHG emissions the mitigation scenario should describe the expected socio-economic developments, technological change (if appropriate), new measures to mitigate GHG emissions and the expected investment in the sector given the implementation of mitigation measures.

Base Year
The base year is the first year of the assessment period, the first year of baseline, mitigation, and adaptation. The base year should be a recent year for which information on the I&FF and O&M is available so that the IF, FF and O&M costs for the first year of these scenarios are all historical data. In fact, the reference year as the starting waves of cost data for each scenario is based.

CHAPTER TWO

2.0 Scope, Data Inputs, and Scenarios

2.1 SECTOR SCOPE

In designing for sustainable transportation system, environmentally friendly means of commuting should be the topmost priority. It has been observed that most of the investments in the transport sector are largely targeted towards infrastructure that support rail, road, air, and marine means of transportation with very little or no regard for the environment. It is about time that priorities should be accorded to projects with outstanding climate credentials.

The Transport sector has the following sub-sectors:

1. Aviation,
2. Marine,
3. Rail, and
4. Road.

To improve understanding of the cost of GHG emissions within the transport sector and their relative significance to facilitate the identification of policies and measures for emissions mitigation, the transport sector focused on two major scopes:

(i) switch from PMS to low carbon emission fuel with focus on the investment on low carbon fuel and implementation of retrofitting of existing technologies into low carbon fuel technologies
(ii) a share of modal shift from road to trains and public mass transit (BRT and metro).

In Nigeria, 38.2 percent of GHG emissions came from the land-use change and forestry sector, followed by the energy, waste, agriculture and the industrial processes sector which contributed 32.6 percent, 14.0, 13.0 percent and 2.1 percent respectively to GHG emissions. The road transportation in Nigeria remains a major user of fossil fuel, with significant increase recorded over the last century, 54% over two and half decades.

2.2 Data Input and Scenarios

There are three broad sources from which data was expected. However, despite spirited efforts made towards engaging these stakeholders with the view of securing the much-needed data, the response so far, has not synced with the pace of data requirement especially in view of the primary characteristic desired of whatever data worth considering.

We tried with no success to get the Federal Ministry of Transport's transmitted copy of the Final Draft of the National Transport Policy (2016) and Medium-Term Sector Strategy (MTSS) for 2017-2019. We understand that these documents were substantially inspired by the Vision 20:2020. Getting such a document from such an authoritative source would be more reassuring. Though versions of this document are obtainable from public domain, getting such a document from the Ministry officially will be most comforting.

Other documents that we require include the National Integrated Infrastructure Master Plan (NIIMP), the Strategic Implementation Plan for the 2016 as well as sub-sector policies related to aviation, rail, maritime and inland water way.

By reviewing these (above-mentioned) set of documents, we seek to understand the level of government commitment in terms of integrated transport policy that is climate friendly and how interdependency can be harnessed towards the desired outcome with emphasis on sustainability. How government intends to create an enabling environment conducive for private participation is equally worth taking note of.

The followings constituted main sources for our data extraction for the purpose of this report, as responses from government agencies were not forthcoming.

Table 2: Data sources

SN	Description	Source
1.	Approved Nigeria's INDC	UNDP, PMU, and FMoE
2.	Executive Summary of the Nigeria's INDC	UNDP, PMU, and FMoE
3	Nigeria INDC Capacity & Data Quality Report FINAL	UNDP, PMU, and FMoE
4.	NDC implementation action plan for the Transport	UNDP, PMU, and FMoE
5.	Federal Government List of Transport Related ongoing projects	From Federal Ministry of Transport Budget Documents

2.2.1 Assessment Period and Cost Accounting Parameters

The base year of the assessment is chosen as 2015. The assessment period for the exercise has also been agreed as 2015 – 2030 according to the contextual nature of the assessment and I&FF methodology. In the utilization of the currency in the exercise, the Nigeria (NGN) was converted to constant 2015 USD. The central bank policy rate of 9.0% is used to compute the Present Value. The current value of the Naira was first deflated using the CPI and then converted to US$. The average exchange rate for 2015 is 1US$ is equal to NGN198, however, using this gives us negative incremental values. Therefore, 1US$ is equal to NGN360 is used, this represents the average exchange rate for 2015-2020.

2.2.2 Analytical Approach

Due to the challenges faced in getting access to much-needed data and information, we resort to assumptions, permutations, and projections. All these were based on the government's previous budgetary provisions, legislations, and conventions.

The trend observed within the transport sector indicates that Nigerians largely depend on automobile for passengers commuting and haulage operations.

Table 3: Matching Population growth with increase in number of vehicles over time

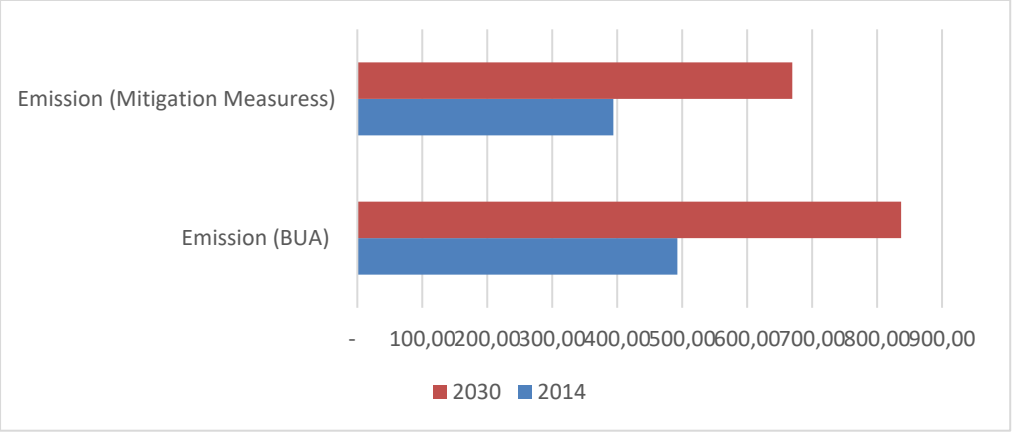
YEAR	NIGERIAN POPULATION	% GROWTH (POPULATION)	ESTIMATED NO OF VEHICLES
2009	154,324,939		9,259,496
2010	158,503,202	2.71	9,510,192
2011	162,805,080	2.71	9,768,305
2012	167,228,803	2.72	10,033,728
2013	171,765,819	2.71	10,305,949
2014	176,404,931	2.70	10,584,296
2015	181,137,453	2.68	10,868,247
2016	185,960,244	2.66	11,157,615
2017	190,873,311	2.64	11,452,399
2018	195,874,740	2.62	11,653,871
2019	200,964,000	2.60	12,057,840.00
2020	205,710,189	2.36	12,342,611.34
2021	211,400,704	2.77	12,684,042.24
2022	216,746,933	2.53	13,004,815.98
2023	222,182,400	2.51	13,330,944.00
2024	227,713,027	2.49	13,662,781.62
2025	233,343,117	2.47	14,000,587.02
2026	239,073,298	2.46	14,344,397.88
2027	244,902,210	2.44	14,694,132.60
2028	250,829,695	2.42	15,049,781.70
2029	256,855,080	2.40	15,411,304.80
2030	262,977,343	2.38	15,778,640.58

Based on the table above, our assumption is that 70 % of the fossil fuel consumption will be from the road transport sector. With the increase in the number of vehicles by 2030 projected to be 70% of fossil-fuel based type, consumption will be directly proportional to that of the projected increase in the number of vehicles. And the implication of that is that carbon emission will jump from 492.44 $MtCO_2e$ to whopping 837.148 $MtCO_2e$.

Table 4: Comparing business as usual scenarios with mitigation measures over time.

Year	Emission (BUA)	Emission (Mitigation Measures)
2014	492.44	393.95
2030	837.15	669.72

Figure 1: Comparing business as usual scenarios with mitigation measures over time.



2.2.3 Historical IF, FF, O&M and Subsidies

Although Nigeria has varying degrees of infrastructure and service provision/availability in the four major means of transportation, namely rail, road, air and inland water ways, road transportation remains the most popular and utilized.

Out of an estimated 200,000km of roads across the nation, only 17% of it is the federal government solely responsible for. This represents about 34,000km of road. Nonetheless, years of neglect in terms of expansion, repairs and routine maintenance led to the already inadequate motorable ways being overburdened and over stretched. In the absence of strategic planning, coupled with the inability of the states and the local government to be sufficiently responsive to challenges of the moment, the situation remains particularly challenging and difficult.

Overdependence on road as a major means of transportation makes the transport sector one of the major contributors to climate degradation in Nigeria. Lack of concerted efforts to combat the menace has led to huge negative impact on various sectors of the economy. The Post Disaster Need Assessment (PDNA) report resulting from the 2012 flood, estimated the lost incurred to over US$ 16 billion. What is more worrisome is that unless action is taken fast the share of agriculture in GDP will drop by more than half of what it is presently. All these, largely due to the disproportionate contribution of the transport sector to environmental pollution.

It is on record that the federal government has made some giant strides towards resuscitating the rail lines with the intent to ensure nationwide (key cities) linkage. However, the positive impact of such a commendable strategy may take a while to start manifesting. Thus, the situation as it is known suggest that roads will continue to be the only viable option that remain readily available and easily accessible to the overwhelming segment of the society. This will surely lead to overcrowding and overstretching of the relatively very few motorable roads available. More so, even the poorly maintained and dilapidated roads will continue to be used in the lack of any viable option in the foreseeable future.

When you juxtapose the above against the fact that most of the vehicles plying Nigerian roads can hardly pass any standardized emission test, the net effect of all these will make the already bad situation worse. By 2035 it is estimated that GHG emission from transportation sector will be 50% worse[iv]. Where the situation

remains persistent, the effect of the climate may put transport infrastructure in jeopardy. **See combined table of scenarios below**.

Automobiles that serve as the primary means of transportation in Nigeria, depend on fossil fuel almost entirely for its operations. We this we concluded that 70% of the fossil fuel consumed in Nigeria goes to road transport. This implies in 2015 for instance, US$ 9.3 billion was spent by both government and private individuals in consuming about 11.8 billion litres of PMS/AGO. And where the trend persists, by the year US$ 153 billion must have been spent in consuming about 16 billion litres of PMS/AGO.

2.2.4 Baseline Scenario

As of 2015, domestic fuel consumption was 11.83 billion litres. This is at the time when the pump price of PMS was US$ 0.2 (NGN87). By the end of the year government and individual spending reached a total sum of US$ 9.3.

Table 5: Fuel Consumption Investment

Investment in Fuel Consumption (2015)	
Fuel (in billions of litre)	11.83
Total Individual operating Investment in Fuel Consumption (USD Millions)	2859
Total Government Investment in Fuel Importation (USD Millions)	2722
Individual cost of Importing Cars (USD Millions)	6653
Total Investment (US$-Million)	9375

Table 6: Baseline Scenario - Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD

Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD						
	Modal Shift			Fuel & Tech		
Investment Entity Category/Source of Funds	**IF**	**FF**	**O&M Costs**	**IF**	**FF**	**O&M Costs**
Total Household Funds	8516.82	425.84	2129.21	73023.83	365.12	23955.60
Corporations						
Domestic						
Domestic equity	2044.04	102.20	511.01	17525.72	87.63	5749.34
Domestic borrowing	1362.69	68.13	340.67	11683.81	58.42	3832.90
Total Domestic Sources	3406.73	170.34	851.68	29209.53	146.05	9582.24
Foreign				0.00	0.00	0.00
FDI	340.67	17.03	85.17	2920.95	14.60	958.22
Foreign borrowing	425.84	21.29	106.46	3651.19	18.26	1197.78
ODA	85.17	4.26	21.29	730.24	3.65	239.56
Total Foreign Sources	851.68	42.58	212.92	7302.38	36.51	2395.56
Total Corporation Funds	4258.41	212.92	1064.60	36511.91	182.56	11977.80
Government						
Domestic						
Domestic funds	567.79	28.39	141.95	4868.26	24.34	1597.04
Foreign	0.00	0.00	0.00	0.00	0.00	0.00
Foreign borrowing	85.17	4.26	21.29	730.24	3.65	239.56
Bilateral ODA	383.26	19.16	95.81	3286.07	16.43	1078.00
Multilateral ODA	383.26	19.16	95.81	3286.07	16.43	1078.00
Total Foreign Sources	851.68	42.58	212.92	7302.38	36.51	2395.56
Total Government Funds	1419.47	70.97	354.87	12170.64	60.85	3992.60
Total Funds	**14194.71**	**709.74**	**3548.68**	**121706.38**	**608.53**	**39926.00**

Figure 2: Baseline Scenario - Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD

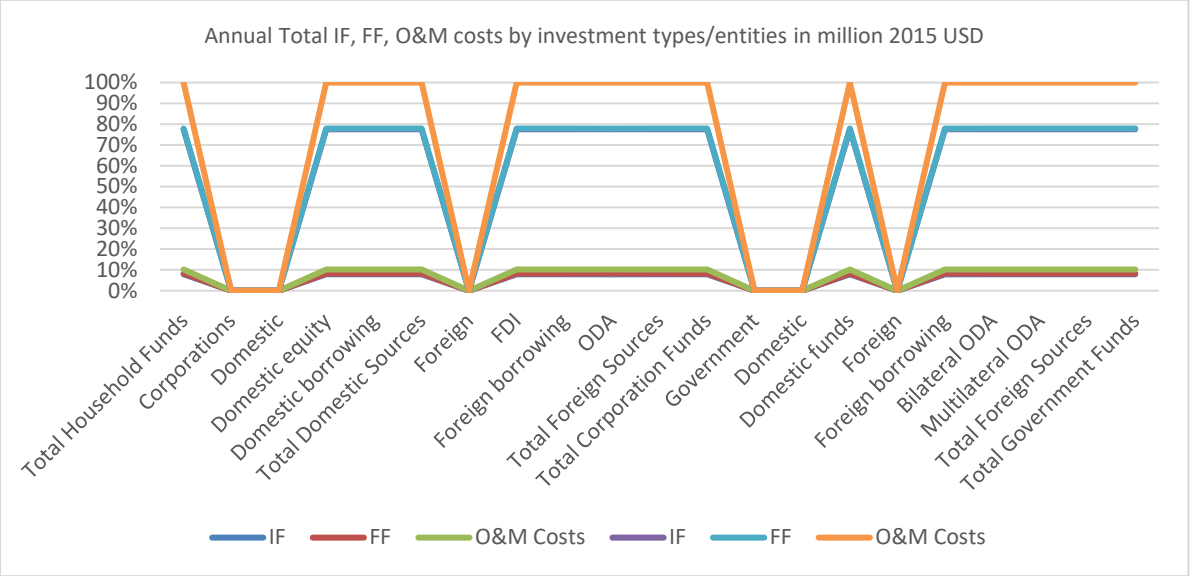


Table 7: Baseline Discounted Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD

Discounted Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD						
	Modal Shift			Fuel & Tech		
Investment Entity Category/Source of Funds	IF	FF	O&M Costs	IF	FF	O&M Costs
Total Household Funds	7813.60	390.68	1953.40	66994.34	334.97	21977.61
Corporations	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Domestic equity	1720.43	86.02	430.11	14751.05	73.76	4839.10
Domestic borrowing	1052.25	52.61	263.06	9022.05	45.11	2959.70
Total Domestic Sources	2772.67	138.63	693.17	23773.09	118.87	7798.81
Foreign		0.00				0.00
FDI	221.41	11.07	55.35	1898.42	9.49	622.78
Foreign borrowing	253.91	12.69	63.48	2177.09	10.89	714.20
ODA	46.59	2.33	11.65	399.47	2.00	131.05
Total Foreign Sources	521.92	26.09	130.48	4474.97	22.37	1468.02
Total Corporation Funds	3294.59	164.72	823.65	28248.06	182.56	9266.83
Government	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Domestic funds	284.95	14.25	71.24	2443.22	12.22	801.50
Foreign	0.00	0.00	0.00	0.00	0.00	0.00
Foreign borrowing	39.21	1.96	9.80	336.22	1.68	110.30
Bilateral ODA	161.89	8.09	40.47	1388.07	6.94	455.36
Multilateral ODA	148.53	7.43	37.13	1273.46	6.37	417.76
Total Foreign Sources	349.63	17.48	87.40	2997.75	14.99	983.42
Total Government Funds	634.59	31.73	158.64	5440.97	27.20	1784.92
Total Funds	**11742.78**	**587.13**	**2935.69**	**100683.37**	**544.74**	**33029.36**

Figure 3: Baseline Discounted Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD

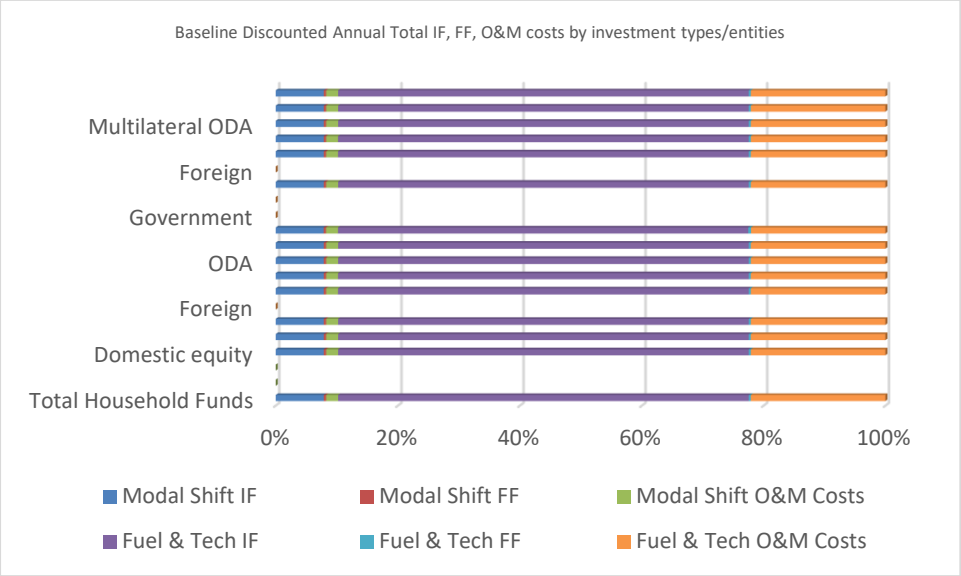


Table 8: BAU Annual Total IF, FF, O&M costs by investment types in million 2015 USD

Year	Modal Shift			Fuel & Tech		
	IF	FF	O&M	IF	FF	O&M
2015	817.38	40.87	204.34	6653.14	33.27	3402.78
2016	838.33	41.92	209.58	6780.04	33.90	3888.89
2017	965.28	48.26	241.32	6906.95	34.53	4788.19
2018	443.06	22.15	110.76	4720.61	23.60	7170.14
2019	727.78	36.39	181.94	9465.22	47.33	2746.53
2020	833.33	41.67	208.33	6672.35	33.36	2499.34
2021	854.17	42.71	213.54	7999.92	40.00	2274.40
2022	875.52	43.78	218.88	7515.91	37.58	2069.70
2023	897.41	44.87	224.35	7641.36	38.21	1883.43
2024	919.84	45.99	229.96	7775.14	38.88	1713.92
2025	942.84	47.14	235.71	7914.97	39.57	1559.67
2026	966.41	48.32	241.60	8055.68	40.28	1419.30
2027	990.57	49.53	247.64	8194.48	40.97	1291.56
2028	1015.34	50.77	253.83	8333.06	41.67	1175.32
2029	1040.72	52.04	260.18	8470.69	42.35	1069.54
2030	1066.74	53.34	266.68	8606.88	43.03	973.28
Total	**14194.72**	**709.75**	**3548.64**	**121706.4**	**608.53**	**39925.99**

Figure 4: BAU Annual Total IF, FF, O&M costs by investment types in million 2015 USD

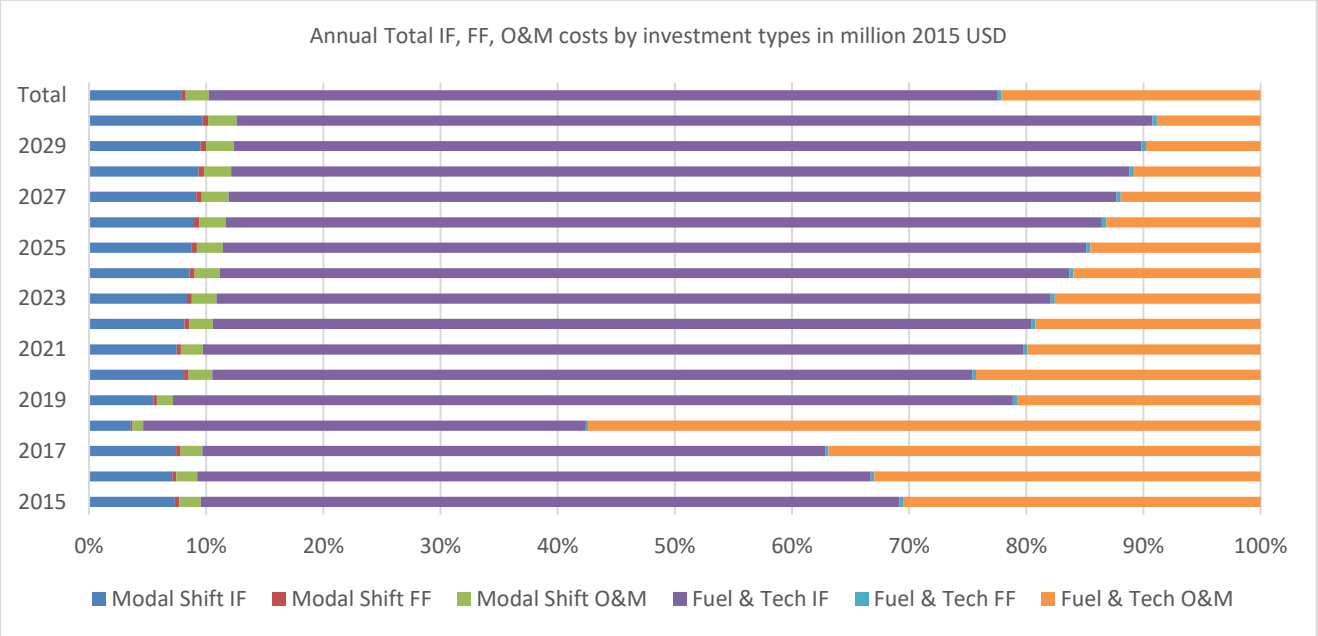
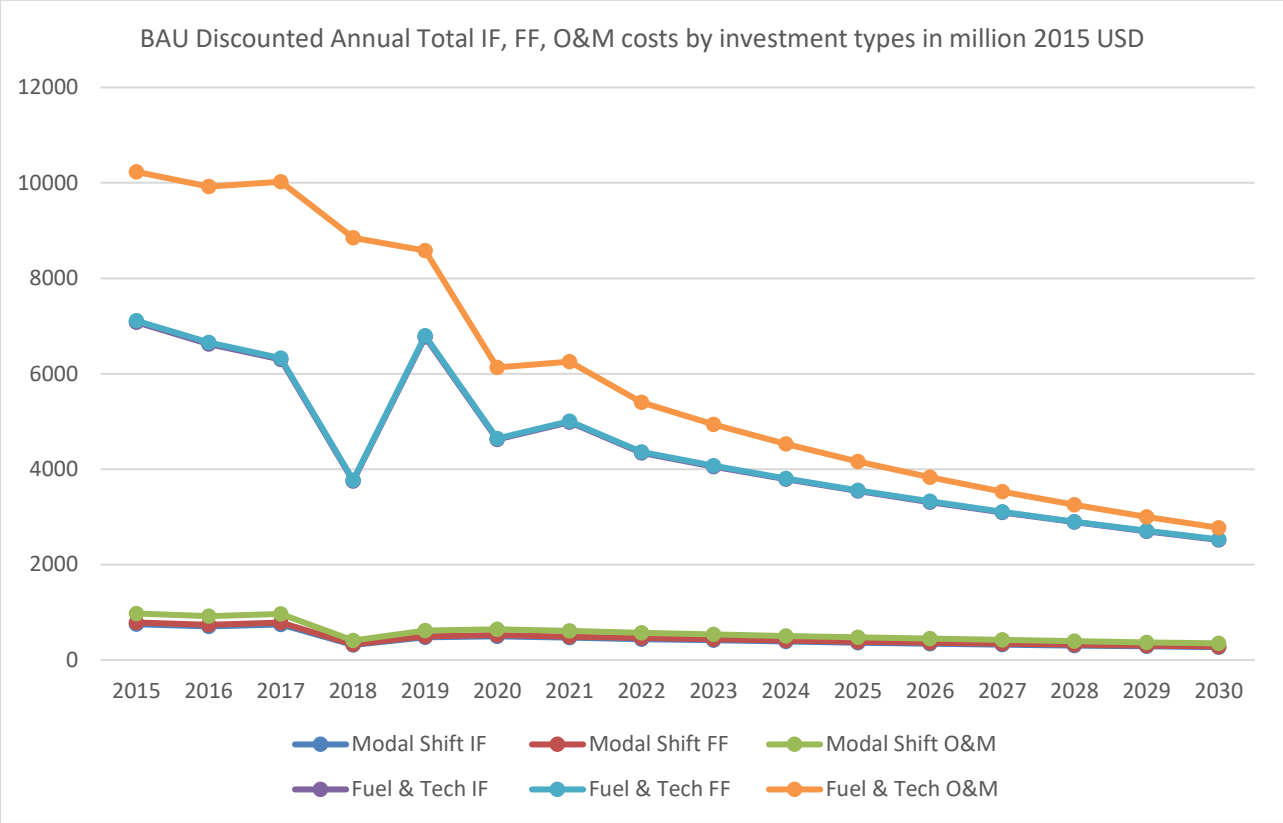


Table 9: BAU Discounted Annual Total IF, FF, O&M costs by investment types in million 2015 USD

Year	Modal Shift			Fuel & Tech		
	IF	FF	O&M	IF	FF	O&M
2015	749.89	37.50	187.468	6103.80	30.52	3121.817
2016	705.61	35.28	176.399	5706.62	28.53	3273.201
2017	745.37	37.27	186.343	5333.43	26.66	3697.361
2018	313.87	15.69	78.465	3344.20	16.72	5079.508
2019	473.01	23.65	118.249	6151.74	30.76	1785.056
2020	496.89	24.85	124.220	3978.50	19.89	1490.275
2021	467.26	23.36	116.814	4376.23	21.88	1244.175
2022	439.39	21.97	109.848	3771.98	18.86	1038.713
2023	413.19	20.66	103.297	3518.29	17.59	867.1835
2024	388.55	19.43	97.138	3284.30	16.42	723.9783
2025	365.38	18.27	91.345	3067.31	15.33	604.4234
2026	343.59	17.18	85.897	2864.07	14.32	504.6104
2027	323.10	16.16	80.775	2672.86	13.36	421.2793
2028	303.84	15.19	75.958	2493.64	12.47	351.7104
2029	285.72	14.29	71.429	2325.53	11.63	293.6294
2030	268.68	13.43	67.169	2167.81	10.84	245.1398
Total	**7083.35**	**354.17**	**1770.814**	**61160.34**	**305.80**	**24742.06**

Figure 5: BAU Annual Total IF, FF, O&M costs by investment types in million 2015 USD



2.2.5 Mitigation Scenario

The assumptions that form the basis for future scenarios are as follows:

Table 10: Climate change measures - Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD

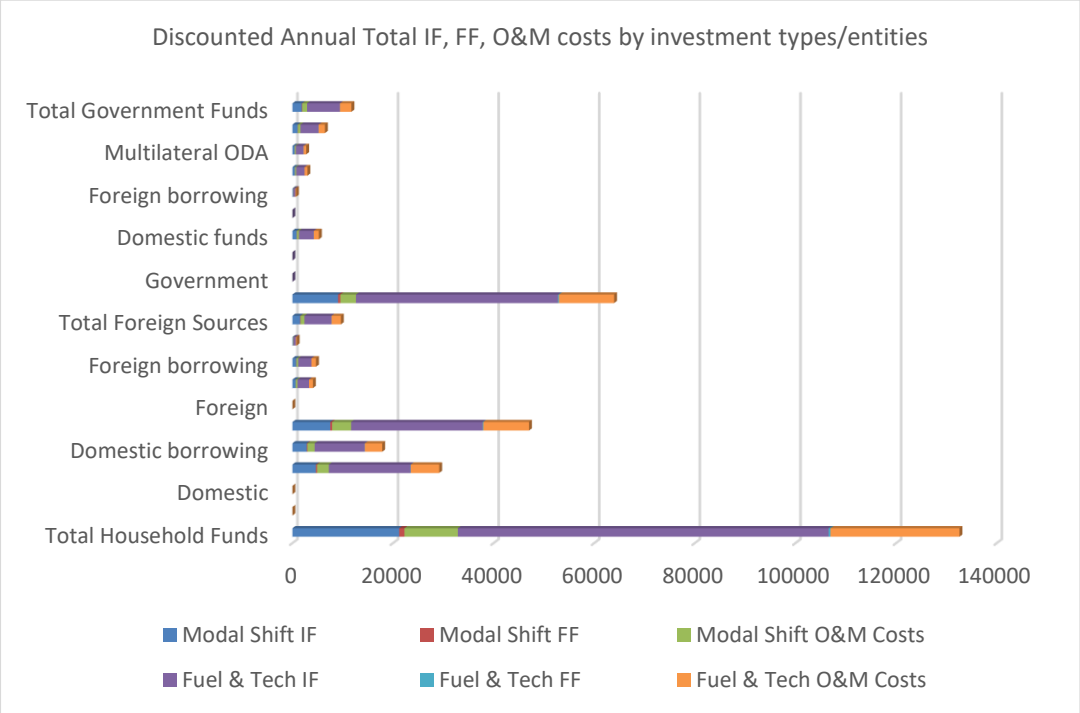
Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD						
	Modal Shift			Fuel & Tech		
Investment Entity Category/Source of Funds	IF	FF	O&M Costs	IF	FF	O&M Costs
Total Household Funds	23130.36	1156.52	11565.18	80339.34	401.70	27943.58
Corporations						
Domestic						
Domestic equity	5551.29	277.56	2775.64	19281.44	96.41	6706.46
Domestic borrowing	3700.86	185.04	1850.43	12854.29	64.27	4470.97
Total Domestic Sources	9252.14	462.61	4626.07	32135.74	160.68	11177.43
Foreign						
FDI	925.21	46.26	462.61	3213.57	16.07	1117.74
Foreign borrowing	1156.52	57.83	578.26	4016.97	20.08	1397.18
ODA	231.30	11.57	115.65	803.39	4.02	279.44

Total Foreign Sources	2313.04	115.65	1156.52	8033.93	40.17	2794.36
Total Corporation Funds	11565.18	578.26	5782.59	40169.67	200.85	13971.79
Government						
Domestic						
Domestic funds	1542.02	77.10	771.01	5355.96	26.78	1862.91
Foreign						
Foreign borrowing	231.30	11.57	115.65	803.39	4.02	279.44
Bilateral ODA	1040.87	52.04	520.43	3615.27	18.08	1257.46
Multilateral ODA	1040.87	52.04	520.43	3615.27	18.08	1257.46
Total Foreign Sources	2313.04	115.65	1156.52	8033.93	40.17	2794.36
Total Government Funds	3855.06	192.75	1927.53	13389.89	66.95	4657.26
Total Funds	**38550.60**	**1927.53**	**19275.30**	133898.90	669.49	46572.63

Table 11: Climate change measures - Discounted Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD

Discounted Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD						
	Modal Shift			**Fuel & Tech**		
Investment Entity Category/Source of Funds	**IF**	**FF**	**O&M Costs**	**IF**	**FF**	**O&M Costs**
Total Household Funds	21220.51	1061.03	10610.26	73705.82	368.53	25636.31
Corporations	0.00	0.00	0.00	0.00	0.00	0.00
Domestic	0.00	0.00	0.00	0.00	0.00	0.00
Domestic equity	4672.41	233.62	2336.20	16228.80	81.15	5644.69
Domestic borrowing	2857.74	142.88	1428.87	9925.87	49.63	3452.41
Total Domestic Sources	7530.15	376.50	3765.07	26154.67	130.77	9097.10
Foreign		0.00	0.00	0.00	0.00	0.00
FDI	655.44	32.77	327.72	2276.57	11.38	791.84
Foreign borrowing	751.66	37.59	375.83	2610.75	13.05	908.07
ODA	137.92	6.90	68.96	479.04	2.40	166.62
Total Foreign Sources	1545.02	77.26	772.51	5366.36	26.83	1866.53
Total Corporation Funds	9075.17	453.76	3108.71	40169.67	200.85	10963.63
Government			0.00	0.00		
Domestic			0.00	0.00		
Domestic funds	843.54	42.18	421.77	2929.89	14.65	1019.08
Foreign			0.00	0.00		
Foreign borrowing	116.08	5.81	58.04	403.19	2.02	140.24
Bilateral ODA	479.25	23.96	239.62	1664.57	8.32	578.97
Multilateral ODA	439.67	21.98	219.84	1527.13	7.64	531.16
Total Foreign Sources	1035.00	51.75	517.50	3594.89	17.98	1250.38
Total Government Funds	1878.54	93.93	939.27	6524.79	32.63	2269.45
Total Funds	**32174.22**	**1608.71**	**14658.24**	**120400.27**	**602.01**	**38869.39**

Figure 6: Climate change measures - Discounted Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD



In the light of the realities on the ground, our suggested mitigation measures are focused, for a start, on two broad areas. Namely: switching from fossil-fuel to low or zero-emission source of energy. Strategies in this aspect include the use of LPG, Biofuel/bioethanol, and electric vehicles.

Table 12: Climate change measures - Annual Total IF, FF, O&M costs by investment types in million 2015 USD

Year	Modal Shift			Fuel & Tech		
	IF	FF	O&M	IF	FF	O&M
2015	48.10	2.41	24.05	6653.14	33.27	4083.33
2016	48.10	2.41	24.05	7004.59	35.02	4666.67
2017	2781.10	139.06	1390.55	7141.35	35.71	5745.83
2018	2781.10	139.06	1390.55	5132.22	25.66	8604.17
2019	2781.10	139.06	1390.55	9935.22	49.68	3295.83
2020	2781.10	139.06	1390.55	7803.41	39.02	2999.21
2021	2733.00	136.65	1366.50	9042.84	45.21	2729.28
2022	2733.00	136.65	1366.50	8635.98	43.18	2297.37
2023	2733.00	136.65	1366.50	8768.38	43.84	2090.61
2024	2733.00	136.65	1366.50	8618.56	43.09	1902.45
2025	2733.00	136.65	1366.50	8782.31	43.91	1731.23
2026	2733.00	136.65	1366.50	8947.53	44.74	1541.36
2027	2733.00	136.65	1366.50	9111.70	45.56	1402.64
2028	2733.00	136.65	1366.50	9276.33	46.38	1276.40

2029	2733.00	136.65	1366.50	9440.77	47.20	1155.11
2030	2733.00	136.65	1366.50	9604.56	48.02	1051.15
Total	**38550.6**	**1927.56**	**19275.3**	**133899**	**669.49**	**46572.6**

Figure 7: Climate change measures - Annual Total IF, FF, O&M costs by investment types in million 2015 USD

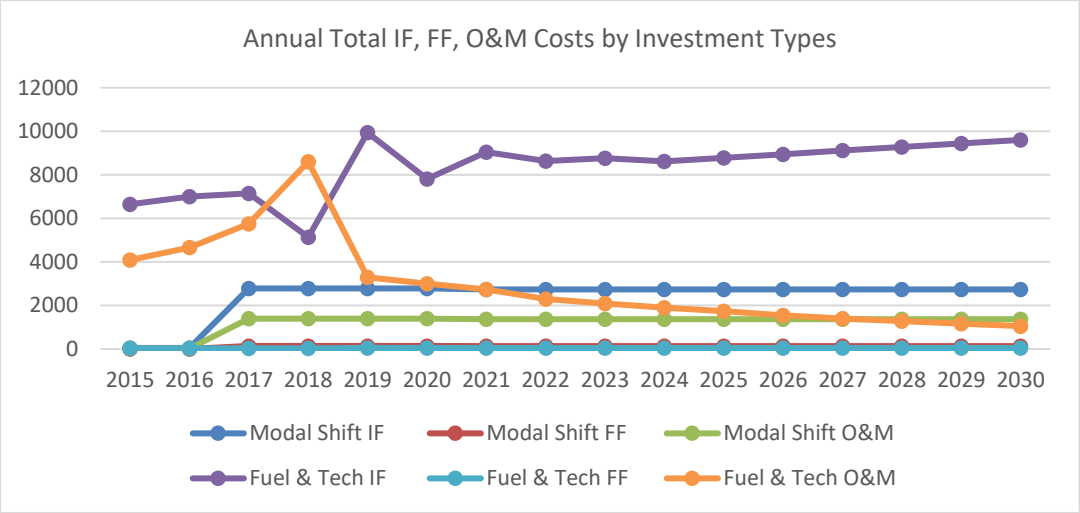
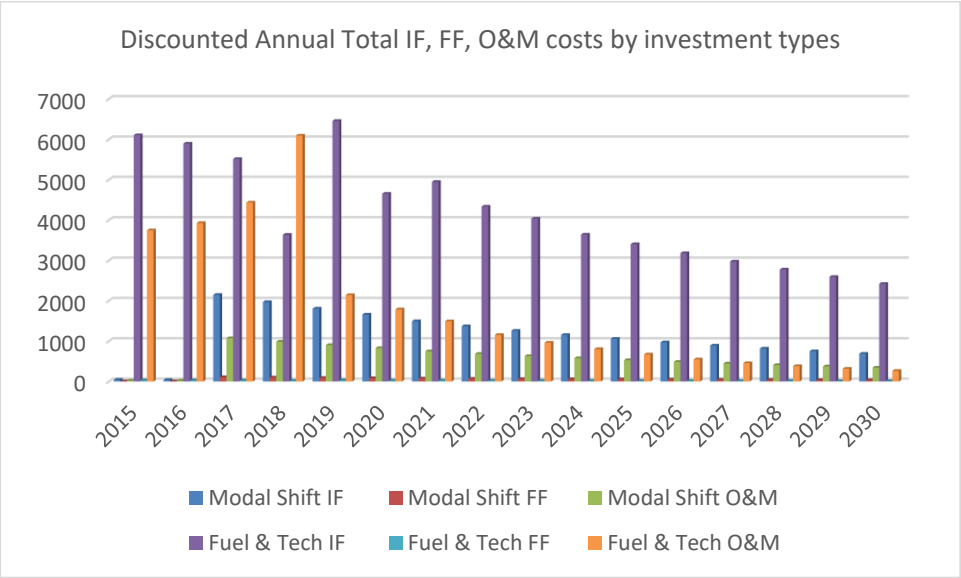


Table 13: Climate change measures - Discounted Annual Total IF, FF, O&M costs by investment types in million 2015 USD

Year	Modal Shift			Fuel & Tech		
	IF	**FF**	**O&M**	**IF**	**FF**	**O&M**
2015	44.13	2.21	22.06	6103.80	30.52	3746.17
2016	40.48	2.03	20.24	5895.62	29.48	3927.84
2017	2147.52	107.38	1073.76	5514.43	27.57	4436.84
2018	1970.20	98.51	985.10	3635.79	18.18	6095.41
2019	1807.52	90.38	903.76	6457.21	32.29	2142.06
2020	1658.28	82.92	829.14	4652.92	23.27	1788.33
2021	1495.04	74.75	747.52	4946.74	24.73	1493.01
2022	1371.60	68.58	685.80	4334.11	21.67	1152.97
2023	1258.35	62.92	629.17	4037.21	20.19	962.57
2024	1154.45	57.72	577.22	3640.57	18.20	803.62
2025	1059.13	52.96	529.56	3403.43	17.02	670.91
2026	971.68	48.58	485.84	3181.16	15.91	548.01
2027	891.45	44.57	445.72	2972.04	14.86	457.51
2028	817.84	40.89	408.92	2775.91	13.88	381.96
2029	750.31	37.52	375.16	2591.85	12.96	317.12
2030	688.36	34.42	344.18	2419.10	12.09	264.75
Total	**18126.34**	**906.34**	**9063.17**	**66561.90**	**332.81**	29189.09

Figure 8: Climate change measures - Discounted Annual Total IF, FF, O&M costs by investment types in million 2015 USD



Note (Assumptions)

1. Nigerian economy will be growing at around 5% for the next foreseeable future.
2. Annual population growth rate will be 2.5%.
3. There will be remarkable improvement in the power sector which translates into stable supply of electricity and wider accessibility by majority of the populace.

Within the given circumstances as indicated above and under the business-as-usual scenario, emission is likely to increase to around 900 million by 2030.

By remaining focused and determined, the climate related challenges and concerns can best be tackled through the ASI (Avoid-Shift-Improve) approach. This is a situation in which inefficient transport solutions leading to unnecessary commuting are largely avoided by embarking on massive investment in climate friendly transport and transport related infrastructure.

Paradigm (modal) shift away from private vehicle ownership/usage to efficient, reliable, accessible, and affordable inter and intra cities public transport system (of goods and passengers) will be a good starting point.

Since it is virtually impossible to eliminate private vehicle ownership and usage, the government may consider making it more climate friendly through stringent legislations. To achieve these, only vehicles with the highest possible fuel economy should be allowed into the country.

Research in areas of emission control technology towards measuring up to the continually upgraded emission standards should be encouraged and supported sustainably. In this aspects, universities and relevant research institutions can be some viable starting points. Use of LPG, CNG and electricity in both public and private vehicles should equally be encouraged preparatory to making it a standard as well as general rule, rather than an exception.

With the rapid expansion and penetration of telecommunications services, the government may wish to embark on public enlightenment, mass mobilization and advocacy in order to sensitize the public with regards to the enabling capabilities and functionalities associated with information and communications technology. With Nigeria achieving 100% tele density as of 2015[v], the need for physical movement of persons ought to drop significantly.

The COVID-19 pandemic that necessitates restrictions of movement has given boost to telecommuting, which invariably led to reduction in the environmental pollution throughout the period it last. This is a bright silver lining amid such a frightening endemic.

Nigeria's response to the challenges of climate change needs to be multi-pronged. Thus, callings for huge investment in human capital and material resources. Efforts should be targeted towards fostering zero or low-carbon programs and projects that in the short, medium, and long run translate into socio-economic growth and development.

To realize this, public institutions need to be strengthened with their respective mandate precisely tailored to this end. Additionally, all related projects and programs should lay emphasis on visible milestones of achievements.

3 RESULTS

Mitigation measures for which I&FF were assessed & results.

The assessment focused on government's pledge to reduce emission in the transport sector via investment in alternate or low carbon emission fuel. Existing literature shows that alternative fuels, can reduce carbon dioxide and other vehicle emissions by 24%. Accordingly, to reduce greenhouse gas emissions in the transport sector the following key climate measures are the basis of investment consideration for the transport sector:

1. Promote aggressively the usage of Liquified Petroleum Gas (LPG) and Compressed Natural Gas (CNG) for transportation by 40% by 2030.
2. Ensure attaining of blending of biofuel in vehicles for transportation by 30% in 2030.
3. Encourage the replacement of PMS cars with electric cars at least by about 10% in 2030.
4. Increase switch of human and freight movement from road to rail.
5. Increase switch of human movement from personal use of vehicles to public mass transit.

The national expert team has determined that the total cost of mitigation projects by 2030 in the transport of Nigeria is conservatively placed at about US$72.7 billion, with $57.2 billion and $15.5 billion accounting for cost relating to switch from PMS to low carbon emission fuel and modal shift from road to rail and PMT, respectively. The breakdown of this cost components is through the implementation of priority actions around:

1. Government investment of $6 billion for the development of 5milion tons LPG infrastructure.
2. Establishment of a 65,000 million liters per annum biofuel plant with initial investment funding of $3.6 billion.
3. Individual and entities investment in cost of switching from PMS to alternative fuel and electric cost to the sum of $56 billion dollars.
4. $3biillion investment in railway expansion per year over a period of 15 years
5. Expansion of BRT lanes and purchase of public mass transit buses amounting to $309 million.

Incremental Changes in IF, FF, O&M Costs

Table 14: Incremental Annual Total IF, FF and O&M for All Investments types/entities in million 2015 USD

Incremental Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD						
	Modal Shift			Fuel & Tech		
Investment Entity Category/Source of Funds	ΔIF	ΔFF	ΔO&M	ΔIF	ΔFF	ΔO&M
Total Household Funds	14613.54	730.68	9435.97	7315.51	36.58	3987.98
Corporations	0	0	0	0	0	0
Domestic	0	0	0	0	0	0
Domestic equity	3507.25	175.36	2264.63	1755.72	8.78	957.12
Domestic borrowing	2338.17	116.91	1509.76	1170.48	5.85	638.07
Total Domestic Sources	5845.41	292.27	3774.39	2926.21	14.63	1595.19
Foreign	0	0	0	0	0	0
FDI	584.54	29.23	377.44	292.62	1.47	159.52
Foreign borrowing	730.68	36.54	471.8	365.78	1.82	199.4
ODA	146.13	7.31	94.36	73.15	0.37	39.88
Total Foreign Sources	1461.36	73.07	943.6	731.55	3.66	398.8
Total Corporation Funds	7306.77	365.34	4717.99	3657.76	18.29	1993.99
Government	0	0	0	0	0	0
Domestic	0	0	0	0	0	0
Domestic funds	974.23	48.71	629.06	487.7	2.44	265.87
Foreign	0	0	0	0	0	0
Foreign borrowing	146.13	7.31	94.36	73.15	0.37	39.88
Bilateral ODA	657.61	32.88	424.62	329.2	1.65	179.46
Multilateral ODA	657.61	32.88	424.62	329.2	1.65	179.46
Total Foreign Sources	1461.36	73.07	943.6	731.55	3.66	398.8
Total Government Funds	2435.59	121.78	1572.66	1219.25	6.1	664.66
Total Funds	**24355.89**	**1217.79**	**15726.62**	**12192.52**	**60.96**	**6646.63**

Figure 9: Incremental Annual Total IF, FF and O&M for All Investment types/entities in million 2015 USD

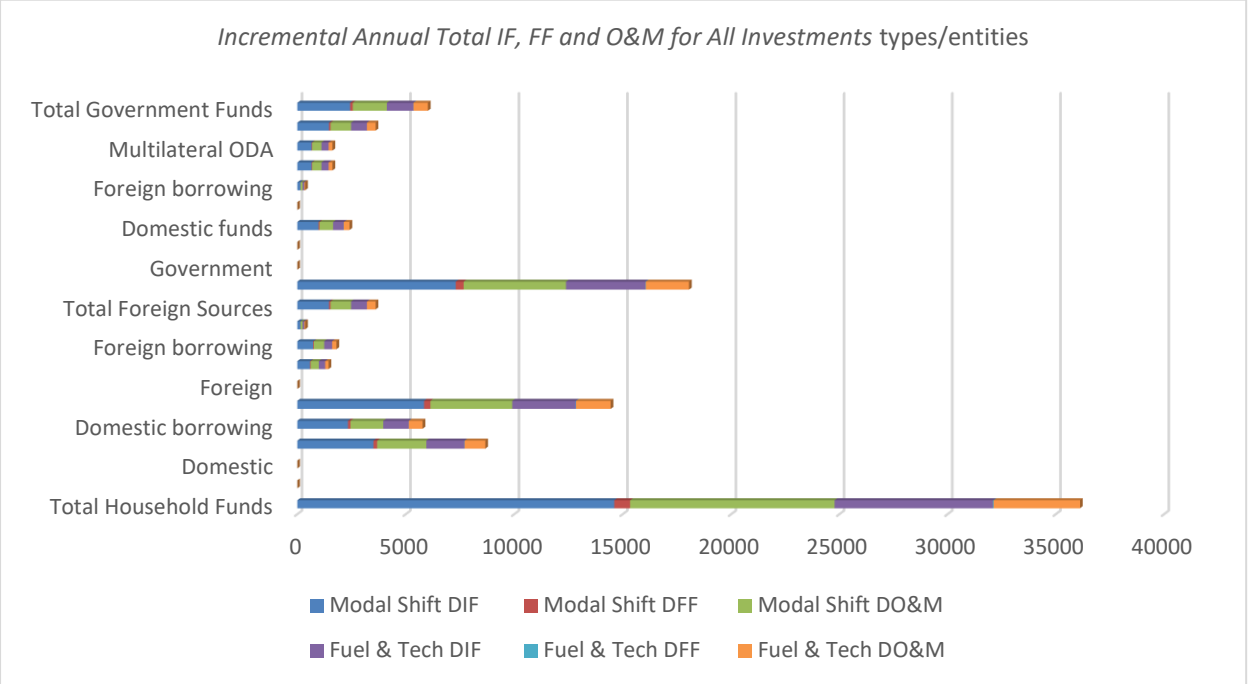


Table 15: Discounted Incremental Annual Total IF, FF and O&M for All Investment types/entities in million 2015 USD

Discounted Incremental Annual Total IF, FF, O&M costs by investment types/entities in million 2015 USD						
	Modal Shift			Fuel & Tech		
Investment Entity Category/Source of Funds	ΔIF	ΔFF	ΔO&M	ΔIF	ΔFF	ΔO&M
Total Household Funds	13406.92	670.35	8656.85	6711.48	33.56	3658.70
Corporations						
Domestic						
Domestic equity	2951.98	147.60	1906.09	1477.75	7.39	805.59
Domestic borrowing	1805.50	90.28	1165.81	903.83	4.52	492.71
Total Domestic Sources	4757.48	237.87	3071.91	2381.58	11.91	1298.30
Foreign						
FDI	414.10	20.71	267.39	207.30	1.04	113.01
Foreign borrowing	474.89	23.75	306.64	237.73	1.18	129.60
ODA	87.13	4.36	56.26	43.62	0.22	23.78
Total Foreign Sources	976.13	48.81	630.29	488.65	2.44	266.38
Total Corporation Funds	5733.61	286.69	3702.19	2870.23	14.35	1564.68
Government						
Domestic						
Domestic funds	532.94	26.65	344.12	266.79	1.33	145.44
Foreign						
Foreign borrowing	73.34	3.67	47.36	36.71	0.19	20.01
Bilateral ODA	302.78	15.14	195.51	151.57	0.76	82.63

Multilateral ODA	277.78	13.89	179.36	139.06	0.70	75.81
Total Foreign Sources	653.90	32.70	422.23	731.55	1.64	178.45
Total Government Funds	1186.84	59.34	766.34	1219.25	6.10	323.89
Total Funds	**20327.36**	**1016.38**	**13125.39**	**10800.96**	**54.01**	**5547.27**

Figure 10: Discounted Incremental Annual Total IF, FF and O&M for All Investment types/entities in million 2015 USD

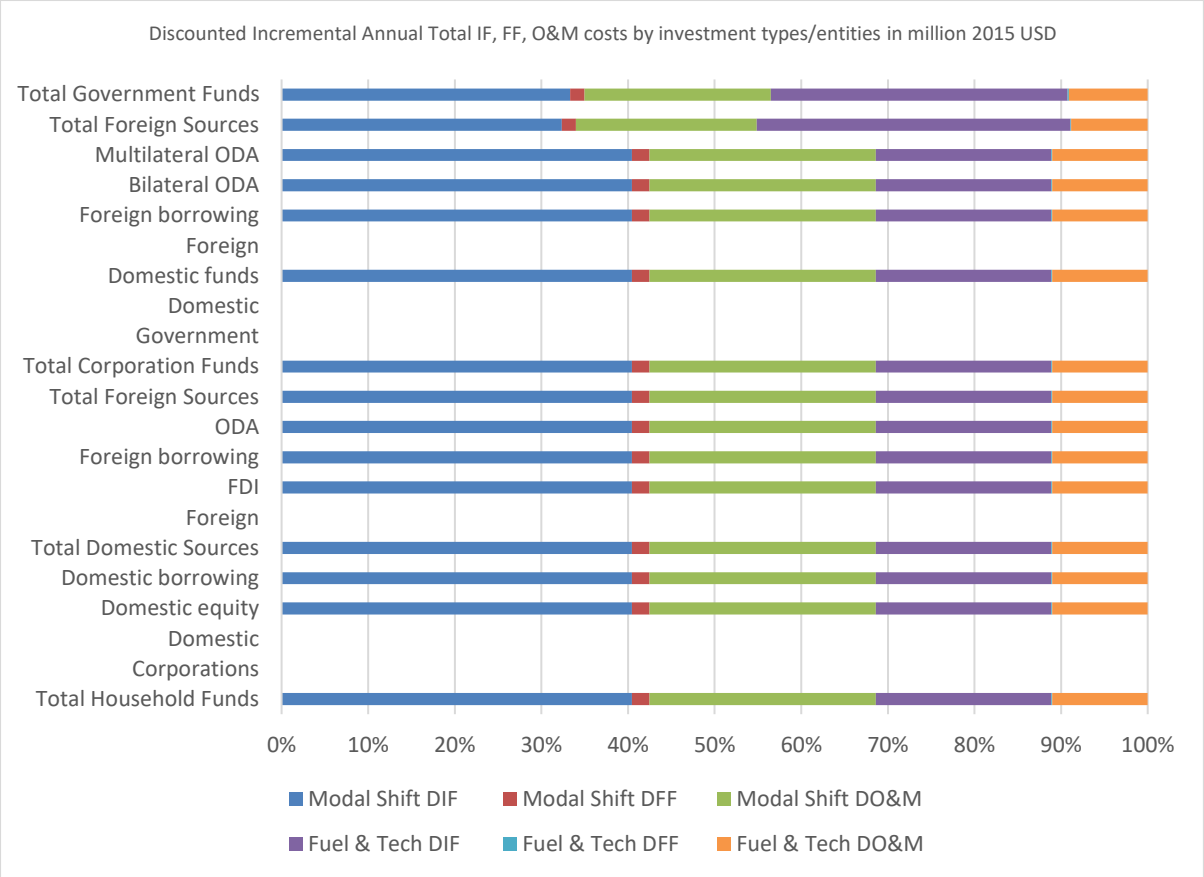


Table 16: Incremental Annual Total IF, FF, O&M costs by investment types in million 2015 USD

Year	Modal Shift			Fuel & Tech		
	ΔIF	**ΔFF**	**ΔO&M**	**ΔIF**	**ΔFF**	**ΔO&M**
2015	-773.25	-38.66	-182.28	-549.34	-2.75	343.39
2016	-797.85	-39.89	-189.34	-884.42	-4.42	38.95
2017	1182.24	59.12	832.44	-1392.52	-6.96	-351.35
2018	1527.14	76.36	874.34	-1084.82	-5.42	-1074.73
2019	1079.74	53.99	721.82	-3008.01	-15.04	-604.47

2020	824.95	41.25	620.81	-2019.43	-10.09	-711.01
2021	640.87	32.04	533.98	-3053.18	-15.27	-781.39
2022	496.08	24.8	466.92	-3181.8	-15.91	-916.73
2023	360.94	18.05	404.82	-3604.15	-18.02	-920.86
2024	234.61	11.73	347.26	-4134.57	-20.68	-910.3
2025	116.29	5.82	293.85	-4511.54	-22.55	-888.76
2026	5.27	0.26	244.24	-4874.52	-24.37	-871.29
2027	-99.12	-4.96	198.08	-5222.44	-26.11	-834.05
2028	-197.5	-9.88	155.09	-5557.15	-27.79	-793.36
2029	-290.41	-14.52	114.98	-5878.84	-29.39	-752.42
2030	-378.38	-18.92	77.5	-6187.78	-30.94	-708.53
Total	**3931.62**	**196.59**	**5514.53**	**-55144.5**	**-275.72**	**-10736.9**

Figure 11: Incremental Annual Total IF, FF, O&M costs by investment types in million 2015 USD

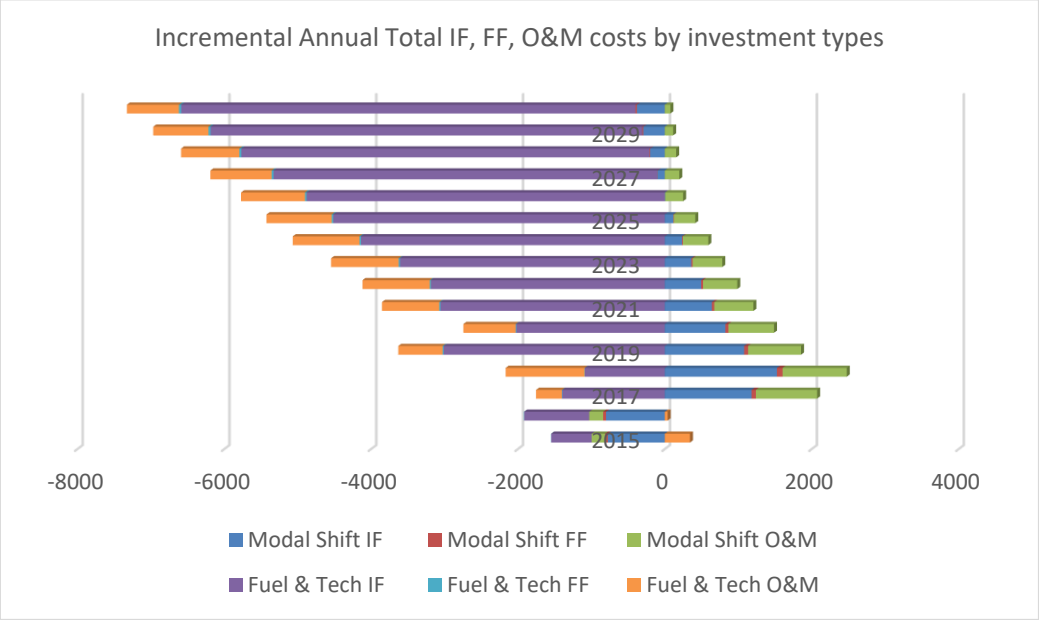
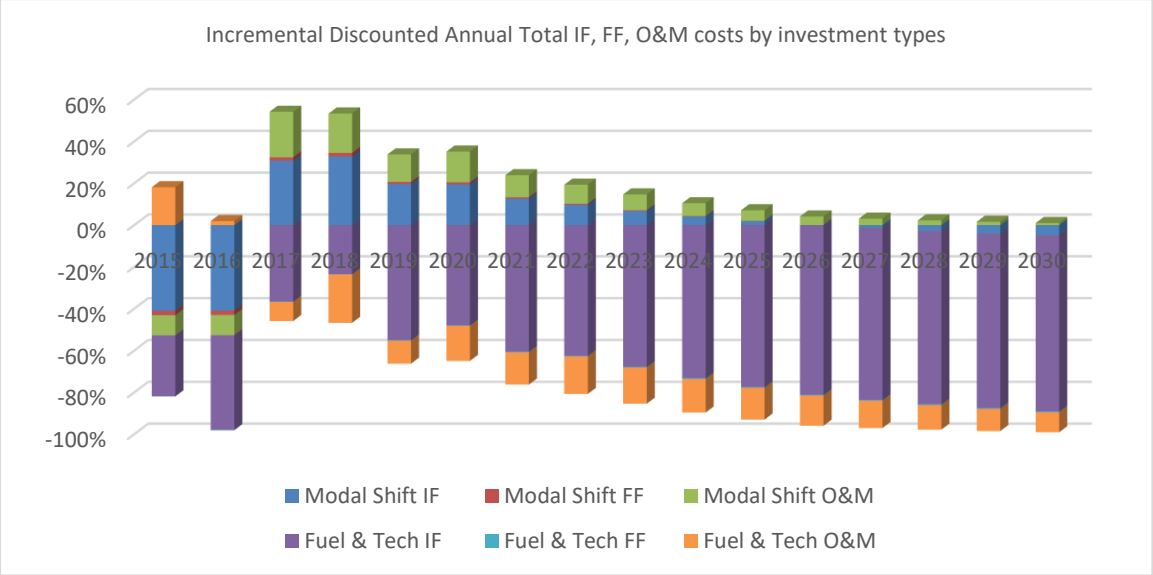


Table 17: Incremental Discounted Annual Total IF, FF, O&M costs by investment types in million 2015 USD

Year	Modal Shift			Fuel & Tech		
	IF	FF	O&M	IF	FF	O&M
2015	-709.40	-35.47	-167.23	-503.98	-2.52	315.04
2016	-671.53	-33.57	-159.36	-744.40	-3.72	32.78
2017	912.91	45.65	642.80	-1075.28	-5.37	-271.31
2018	1081.86	54.10	619.40	-768.51	-3.84	-761.37
2019	701.76	35.09	469.13	-1955.00	-9.77	-392.86
2020	491.89	24.60	370.17	-1204.12	-6.02	-423.95
2021	350.58	17.53	292.11	-1670.19	-8.35	-427.45
2022	248.97	12.45	234.33	-1596.84	-7.98	-460.08
2023	166.19	8.31	186.39	-1659.45	-8.30	-423.99
2024	99.10	4.95	146.69	-1746.49	-8.74	-384.52
2025	45.07	2.26	113.88	-1748.37	-8.74	-344.42
2026	1.87	0.09	86.84	-1733.06	-8.66	-309.77
2027	-32.33	-1.62	64.61	-1703.45	-8.52	-272.05
2028	-59.10	-2.96	46.41	-1662.96	-8.32	-237.41
2029	-79.73	-3.99	31.57	-1613.97	-8.07	-206.57
2030	-95.30	-4.77	19.52	-1558.51	-7.79	-178.46
Total	**2452.79**	**122.65**	**2997.24**	**-22944.58**	**-114.72**	**-4746.38**

Figure 12: Incremental Discounted Annual Total IF, FF, O&M costs by investment types in million 2015 USD



Policy Implications

Findings from our analysis indicate that individuals and corporations will incur the highest investment resulting from switching of PMS engines to LPG or biofuel engines, in addition to the purchase of batteries for electric cars. It therefore becomes imperative for the government to provide subsidies or incentives to improve the interest of individuals and cooperation in switching from PMS to low carbon emission alternatives. If the targets set are to be realised timely and in the most cost-effective manner, policy thrust should centre around the principles and practice of sustainability towards socio-economic wellbeing of the populace. Readiness requirements for climate finance as it relates to transport sector entails strategic goal setting, public incentives, financial policy, and capacity building. Policy documents such as INDC retain some pointers to the effect that Nigeria is open to collaborative and far-reaching initiatives pointed towards GHG reduction. It is hoped this will equally serve as an instrument of socio-economic development. Transport sector is one of the key areas where taking informed and decisive steps translate to prosperity with its attendant positive ripple effects.

However, to realise some impressive milestones, high level multi sectoral collaboration is essential. Active collaborative engagement from various MDAs such as FMoE, FMoT, FRSC, VIOs, NAC is key to the success of measures that will be taken. Out of the four sub-sectors under transport (road, rail, aviation and marine) we advised that much emphasis be given to the road and rail transport at the beginning.

Maintenance, rehabilitation, and facility upgrade coupled with expansion and construction of new routes will go a long way in triggering modal shift characterised by effective, efficient, accessible, and affordable mass public transit scheme. Adequate annual budgetary provisions, Medium Term Sector Strategy (MTSS), National Integrated Infrastructure Master Plan (NIIMP), National Transport

Policy and other relevant sector/sub-sector specific policies are some of the policy documents that can be leveraged on.

Going forwards, all government policies towards GHG reduction should be guided and inspired by the Avoid-Shift-Improve (ASI) scenario. Indiscriminate movement of passenger and goods should be avoided. Where it becomes necessary, options with favourable climate credentials should take precedence.

As earlier mentioned, the advent of COVID-19 pandemic has brought to the fore, how telecommuting, telemedicine, e-learning, teleconferencing/telepresence are gradually becoming ubiquitous with attendant benefits of improved productivity and possible drop in operations cost and maintenance.

Since measures recommended towards mitigations/adaption entails huge investment, a nation hardly go far playing solo. For success to be realised in record time, government at all levels should develop policies that are supportive of active private participations. Development partners have some strategic roles to play. As such policy framework that stimulates and enhance synergy is most desirable.

To this end, actors that include donor agencies, government MDAs at federal, state and local government levels, institutional investors, capital and financial markets, private individuals etc should all be working in synch towards some rallying points. The government may wish to explore the opportunities available with funds that support climate related initiatives including but not limited to the followings:

1. ADB Clean Energy Fund
2. Clean Development Mechanism
3. Clean Technology Fund
4. Global Climate Change Alliance
5. Global Environment Facility

Leveraging climate finance requires a regulatory and institutional framework that is effective, stable, and accountable[vi]. Earning the trust and confidence of non-governmental stakeholders will largely depend on economically viable and socially resilient is that initiatives. Funds accessed must be utilised in accordance with the terms and conditions mutually stipulated in a way that is prudent and most rewarding.

Key Uncertainties and Methodological Limitations

Currently, there exists no (common) database system being used by the authorities to record, monitor, and measure progress or development in Nigeria's transport sector. Also, there is massive bureaucratic bottlenecks around access to required data hence extrapolations and projections were utilized to develop the bulk of background data that fed into the scenarios in respect of class and total number of registered and/or operating units, annual carbon emissions, and fossil fuel consumed over the assessment period.

The dearth of data and some of the much-needed information from most of the MDAs we reached out to, remains a major constrain that compelled us making reasonable assumptions, permutations, and projections under the climate of uncertainty. Need for effective and efficient means of transportation has been a topic of interest for wide range of stakeholders. However, it is regrettable

to note that virtually, all means of transportation with impressive climate credentials hardly make it to the priority list in terms of policy planning, implementation, investment, and financial commitments.

Conclusion

The purpose of this project is to extensively study and analyze the impact of transport sector on environment and the possible effect of climate change on the transport sector across its value chain and investigate the investment, financial, operations and maintenance flows within the sector for the purpose of fore- and back-casting.

Scenarios such as business as usual, cost of adaptation/mitigation measures with its attendant incremental cost is equally expounded. Special emphasis has been given on rail and road sub-sectors as both are identified as sub-sectors with higher potential to deliver on low carbon emission and modal shift. Since Nigeria has committed to the NDC, it is only logical that all hands should be on deck to deliver on the promises made.

Availability of data and other relevant information from the MDAs was a serious challenge. Hence, our resort to other alternate means that are equally credible and authoritative. Fossil fuel consumption upon which the business-as-usual scenario was modeled is a function of projections and informed assumptions made based on registered vehicles with population growth rate used as the basis for the number of vehicles annual growth rate. Data in the rail sector is mostly limited, yet it is expected to be a major game changer in the long run. Particularly so that federal government's resolve and determination in addressing the infrastructural deficits in the rail sector is most commendable.

The major challenges to the realization of the visions contained in this document include funds as well as in-country skilled and experienced human capital.

Recommendations

The transport sector is responsible for 18% of global GHG emissions, and emissions continue to grow.

To this end, our quick wins and low hanging fruits shall include:

1. Travel Demand Management (the flip side of infrastructure, focused on understanding how people make their transportation decisions and helping people use the infrastructure in place for transit, ridesharing, walking, biking, and telework. It is cost-effective in guiding the design of our transportation and physical infrastructure so that alternatives to driving are naturally encouraged and our systems are better balanced) on a nationwide scale by responsible authorities Local, State and Federal level,

2. Some strategic selection of ongoing projects with climate credentials including but not limited to repairs, rehabilitation, upgrades, expansions as well as provision of new rail lines, roads, and other supporting infrastructure,

3. Public enlightenment with respect to the use of low emission fuel and use of public transport that translate into quantum leap in terms of modal shift is strongly recommended,

4. Pricing policies in the transport sector can play an important role in reducing GHG emissions and can be considered win–win policies because of the multitude of environmental, social, and economic benefits they bring. It covers policies that remove fuel subsidies, increase fuel taxes and levies, introduce road pricing, and establish purchase incentive programmes for more efficient vehicles. Implemented well, these policies reduce vehicle travel, and cause shifts to more efficient modes of transport (such as public transit), and more fuel-efficient vehicles and alternative-fuel vehicles.

5. To measure up to the NDC needs and requirements as submitted by the federal government, the need for an accessible, affordable, safe, reliable, comfortable, integrated, and inter-modal transport system for goods and passengers cannot be over emphasised. This calls for an intersection of National Transport Master Plan, National Transport Policy, Strategic National Spatial Integration Plan, (six) Regional Development and Differentiation Plans – none of these strategies, as of this moment, is in place (or current).

6. Switching from fossil fuel to low and zero emission energy sources (LPG/LNG, Bioethanol or blended and electric vehicles) is equally most desirable.

7. All projects with climate credentials should be bankable, economically viable and socially resilient. “Elitist” projects that may grow into white elephant jobs should be avoided to earn enduring investors’ trust and confidence.

8. ‘Greening’ road transportation through improved fuel efficiency are avenues worth exploring. Compulsory vehicle testing and port restrictions on fuel inefficient vehicles are possible ways of improving the efficiency of the transport fleet.

Data Gathering Challenges and Mitigation Plan

The team had challenges with stakeholder engagements, and this lends further credence to the need to carry out, within the Transport Sector, a strategic stakeholder engagement and enlightenment project to ensure that the stakeholders not only acknowledge but take ownership of the data needs of future NDC and IFF assignments as well as institutionalize the gathering of these relevant data per time.

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ENDNOTES

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[ii] U.S. Energy Information Administration (EIA)

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[v] [v] The Communicator, Issue #25, Quarter ¾ Edition, December 2018

[vi] [vi] (Leipziger, 2013)