**United Nations Development Programme**

**Country: Nigeria**

**TACC Project Document**

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| **Project Title:** | **Territorial Approach to Climate Change in Delta State** (Long-term planning for low emission, climate-resilient development in Delta State, Nigeria.) |
| **UNDAF Outcome(s):**  | UNDAF Outcome B.1. Enabling policies and investments lay the basis for foster and more growth in output and employment in the rural economy.UNDAF Outcome C.1. Policies, investments and institutional changes enable access to quality social services to achieve development targets, including progressive realisation of the MDGs |
| **UNDP Strategic Plan Environment and Sustainable Development Primary Outcome:** Mobilizing environmental financing **UNDP Strategic Plan Secondary Outcome:** Mainstreaming environment and energy |
| **Expected CP Outcome(s):** Environmental governance at Federal level and in selected States based increasingly on policy, legal and regulatory frameworks and actions that are more likely to protect natural resources as well as livelihoods; and ii) a minimum threshold of national action on climate change achieved |
| **Expected CPAP Output (s):** A broad consensus achieved by stakeholders on the priorities, scope, pace and intended effects of a comprehensive framework for environmental governance (Federal and State); and ii) a policy, institutional and financing framework in place at national level by 2010 to combat climate change. |
| **Cooperating Entity:** United Nations Development Programme |
| **Implementing Entities:** Delta State Ministry of Environment and Delta State Climate Change Department |

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| **Brief Description**Reduction in the vulnerability of communities in Delta State to the nexus of environmental degradation and climate change impacts. Nigeria is faced with a number of climate change challenges across a wide range of sectors. In particular, an increased frequency of floods and droughts, soaring mean annual temperatures and sea level rise threaten food and water security over large parts of the country. Delta State, situated in the Niger Delta floodplain on the coast of Nigeria, is particularly vulnerable to such impacts, and is already experiencing the detrimental effects of climate change. This vulnerability to climate change is exacerbated by extreme levels of environmental degradation which have reduced the supply of ecosystem goods/services and thus the coping capacity of many rural communities. In addition to its adaptation challenges, Delta State faces considerable mitigation problems, in comparison to other African states/countries, as a result of the exceptionally high quantities of greenhouse gas (GHG) emissions from gas flaring within the oil industry. This Delta State programme will undertake a  Territorial Approach to Climate Change (TACC) to facilitate low emission climate-resilient development (LECRD), and thereby tackle both mitigation and adaptation problems within Delta State. A core focus of the work will be to understand the relationships between climate change impacts and environmental degradation in Delta State, and to build government and private sector capacity to assess and implement appropriate mitigation and adaptation interventions.  |

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| **Programme Period:** | 2011 – 2014 |
| **Atlas Award ID:** | 00060294 |
| **Project ID:** | 00075853 |
| **Start date:** | June - 2012 |
| **End Date** | May - 2014 |
| **Management Arrangements** | NEX |
| **PAC Meeting Date** |  |

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| Total resources required (total project funds) | $ 1,000,000 |
| **Total allocated resources (UNDP managed funds)** | **$ 1,000,000** |
| Regular (UNDP TRAC) | - |
| Delta State Government | $1,000,000 |
|  Other (partner managed resources) | - |

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**Delta State Ministry of Environment Signature Day/Month/Year**

**UN Resident Coordinator & UNDP Res. Representative Signature Day/Month/Year**

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| **Project Summary****Project objective**: Reduction in the vulnerability of communities in Delta State to the nexus of environmental degradation and climate change impacts. Nigeria is faced with a number of climate change challenges across a wide range of sectors. In particular, an increased frequency of floods and droughts, soaring mean annual temperatures and sea level rise threaten food and water security over large parts of the country. Delta State, situated in the Niger Delta floodplain on the coast of Nigeria, is particularly vulnerable to such impacts, and is already experiencing the detrimental effects of climate change. This vulnerability to climate change is exacerbated by extreme levels of environmental degradation which have reduced the supply of ecosystem goods/services and thus the coping capacity of many rural communities. In addition to its adaptation challenges, Delta State faces considerable mitigation problems, in comparison to other African states/countries, as a result of the exceptionally high quantities of greenhouse gas (GHG) emissions from gas flaring within the oil industry. This Delta State programme will undertake a  Territorial Approach to Climate Change (TACC) to facilitate low emission climate-resilient development (LECRD), and thereby tackle both mitigation and adaptation problems within Delta State. A core focus of the work will be to understand the relationships between climate change impacts and environmental degradation in Delta State, and to build government and private sector capacity to assess and implement appropriate mitigation and adaptation interventions. Importantly, the TACC programme will conduct baseline assessments of the biophysical and socio-economic factors underpinning climate change impacts in Delta State. These assessments will include *inter alia*: i) cross-sectoral studies on the nexus between environmental degradation and climate change impacts; ii) identification of communities in Delta State most vulnerable to climate change; and iii) identification of appropriate GHG mitigation and adaptation options. These assessments will inform the process of identifying constraints and opportunities that Delta State will face as a result of climate change. Thereafter, strategies and plans will be identified and developed to address these constraints and capitalize on opportunities. In particular, a robust climate profile and Integrated Territorial Climate Plan (ITCP) will be developed for Delta State. These strategies and plans will enable the state government to mainstream GHG mitigation and adaptation options into policies, thereby changing the current development trajectory to one that is focused on LECRD. Importantly, the TACC programme will identify a comprehensive list of potentially appropriate GHG mitigation and adaptation interventions requiring substantial and long-term investment. Feasibility studies will be undertaken and bankable project business plans will be developed. As a parallel process, high priority interventions will be implemented in order to showcase quick win activities and catalyze up scaling. Lastly, the TACC programme will disseminate lessons learned and knowledge to other states within the Niger Delta and the Federal Government. An ethos of adaptive management in the mitigation and adaptation arena within Delta State will be fostered through the provision of continually updated information from the assessment as well as implementation process of the TACC programme. Delta State will serve as a pilot project for this approach to be up scaled to other regions within Nigeria. The TACC programme’s outputs will include:1. Biophysical and socio-economic assessment of the nexus of environmental degradation and climate change undertaken.
2. Plans for GHG mitigation and adaptation investments developed in Delta State, in both the public and private sector.
3. GHG mitigation and adaptation interventions piloted in communities most vulnerable to climate change impacts.
4. Best practices for development of GHG mitigation and adaptation investments disseminated to national government and to local authorities in other states within the Niger Delta.
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# List of Acronyms

|  |  |  |  |
| --- | --- | --- | --- |
| AAP | Africa Adaptation Programme | IMCCC | Inter-Ministerial Committee on Climate Change |
| AFOLU | Agriculture, Forestry and Other Land Use | ITCP | Integrated Territorial Climate Plan |
| AOSP | Always on Solar Project | LECRD | low-carbon and climate-resilient local development |
| ARR | Afforestation, Reforestation and Restoration | LGA | Local government areas |
| AWP | Annual Work Plans | MDG | Millennium Development Goal |
| BDCP | Bioresources Development and Conservation Programme | MOU | Memorandum of Understanding |
| BNRCC | Building Nigeria’s Response to Climate Change | NASPA | National Adaptation Strategy and Plan of Action |
| CCAA | Climate Change Adaptation in Africa | NCCIDC | National Climate Change Information/Data System |
| CCCU | Climate Change Coordination Unit | NDDC | Niger Delta Development Commission |
| CDM | Clean Development Mechanism | NDP | National Development Plan |
| CERD | Center for Energy Research and Development | NEEDS | National Economic Empowerment and Development Strategy |
| CIDA | Canadian International Development Agency | NEPAD | New Partnership for Africa Development |
| C-NCCCDP | The Canada-Nigeria Climate Change Capacity Development Project | MDNA | Federal Ministry of Niger Delta Affairs |
| CPAP | Country Programme Action Plan | M&E | Monitoring and Evaluation |
| CTA | Chief Technical Advisor | MoE | Ministry of the Environment |
| DESOPADEC | Delta State Oil Producing Areas Development Commission | NEST | Nigerian Environmental Study Action Team |
| DFID | UK Department for International Development | Nigeria-CAN | The Climate Action Network |
| EW | Early Warning System | NOSDRA | National Oil Spill Detection and Response Agency |
| EBA | Ecosystem-Based Adaptation | NRDARP | Natural Resource Damage Assessment and Restoration Project |
| ECOWAS | Economic Community of West African States | NTFPs | Non-timber forest products |
| FACE | Funding Authorization and Certificate of Expenditure | NWFPs | Non-wood forest products |
| FAA | Finance and Administration Assistant | NYCC | Nigeria Youth Climate Coalition |
| FAO | Food and Agricultural Organisation of the United Nations | OPEC | Organisation of the Petroleum Exporting Countries |
| FGA | Federal Government Agency | PDD | Project Design Document |
| FGN | Federal Government of Nigeria | PIN | Project Idea Notes |
| GCSI | Global Climate Strategies International | PIC-CDM | Presidential Implementation Committee on Clean Development Mechanisms |
| GDP | Gross Domestic Product | PM | Programme Manager |
| GEMS/Water | Global Environment Monitoring System | PMU | Programme Management Unit |
| GHG | Greenhouse Gases | PPP | Public private partnerships |
| GIS | Geographic Information Systems | PRSP | Poverty Reduction Strategy Paper |
| HACT | Harmonized Approach to Cash Transfers | RWH | Rainwater harvesting |
| IC | International Consultant | SBAA | Standard Basic Assistance Agreement |
| IDRC | International Development Research Centre | SCCU | Special Climate Change Unit |
| SGP | Small Grants Programme |  |  |
| SEEDS | State-level Economic Empowerment and Development Strategies |  |  |
| SLR | Sea Level Rise |  |  |
| TACC | Territorial Approach to Climate Change |  |  |
| ITCP | Integrated Territorial Climate Plan |  |  |
| TOR | Terms of Reference |  |  |
| TRAIN | National Carbon Credit Train |  |  |
| UEMOA | West African Economic and Monetary Union |  |  |
| UNDAF | United Nations Development Assistance Framework |  |  |
| UNDP | United Nations Development Programme |  |  |
| UNFCCC | United Nations Framework Convention on Climate Change |  |  |
| UNEP | United Nations Environment Programme |  |  |
| USEPA | United Nations Environmental Protection Agency |  |  |
| VCS | Voluntary Carbon Standard |  |  |
| WG | Working Groups |  |  |
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# A. Situation Analysis

**Global context**

1. Nigeria, with its large population, extensive coastline and low-lying delta, is especially vulnerable to climate change. This is particularly so for Delta State, which is situated within a large floodplain on the coast of Nigeria. Indeed, Delta State is already vulnerable to current climate variability largely as a result of extensive environmental degradation (see paragraph) and a legacy of the industrial activity within the state. Nigeria, and specifically Delta State, also have high levels of Greenhouse Gas (GHG) emissions due to the intense industrial activity, its fossil-fuel dependent economy, and gas flaring in the oil industry. As such, Nigeria recognises the urgent need to respond to the climate change challenge by adapting to its impacts (through adaptation) in order to reduce threats to its population. Additionally, adaptation as well as GHG emissions reduction (through GHG mitigation[[1]](#footnote-1)) is essential in order to reduce threats to natural resources.
2. Adaptation is a context-based activity, with planning and implementation of adaptation measures occurring in response to unique circumstances and capacity at different scales. The sub-regional or local level are the most appropriate for the implementation of adaptation measures in a number of areas, such as water resource management, biodiversity conservation and infrastructure planning. In the field of GHG mitigation, sub-national authorities have at their disposal a wide array of actions they can undertake. These range from influencing transport use and emissions to the promotion of decentralized cleaner energy production, particularly through renewable resources, composting and recycling of waste amongst others.
3. While local and regional governments implement national policies, they also have regulatory and planning functions. They are simultaneously policy-makers and financial/infrastructural investors in a number of sectors responsible for GHG emissions (basic services, transportation, construction, training, etc.) or other sectors that are impacted by climate change (disaster risk reduction, natural resource management, and socio-economic development). The reduction of carbon-intensive energy use (e.g. fossil fuel, fuelwood) while improving energy access is one of the major challenges that local authorities face, as is the reduction of vulnerability against climate change.
4. Because of its impacts on society as a whole and a wide range of economic sectors, climate change is no longer viewed as just an environmental matter but also as a development matter. To effectively address the impacts of climate change, progressive policy regimes and adaptation/mitigation interventions need to be established. This will require a strategic approach to address the dual challenges of poverty reduction and climate change at all levels (i.e. global, continental, national, regional, provincial and the community level). Responding effectively to climate change not only involves managing risk through GHG mitigation measures, but also building resilient ecosystems, and fostering communities that can rapidly advance sustainable development. Therefore, GHG mitigation and adaptation are both required to manage climate-related risks. GHG mitigation and adaptation responses complement each other to significantly reduce the risks of climate change, and together they can also bring opportunities in terms of local development. For example, GHG mitigation and adaptation policies can improve energy access, employment and wealth creation and rehabilitate degraded land through forestry. In this context, UNDP’s climate change strategy is to *support the design of integrated climate change (adaptation and mitigation) policies, strategies and quantified action plans that promote long term sustainability and poverty reduction*[[2]](#footnote-2)*.*This integrated approach is grounded in the fact that GHG mitigation is essential to avoid the unmanageable, while adaptation is crucial to manage the unavoidable.
5. In pursuance of an integrated planning framework, UNDP together with the United Nations Environment Programme (UNEP) and other partners have developed an initiative known as Delta State TACC programme (hereafter referred to as 'the TACC programme'). The main objective of TACC is to assist sub-regional governments in achieving climate resilient and low-carbon development by developing and implementing an Integrated Territorial Climate Plan (ITCP). TACC is based on the premise that the implementation of GHG mitigation and adaptation measures necessary to successfully address the challenge of climate change can only be achieved and sustained if all the stakeholder groups and decision-makers at all levels are fully involved and committed. As a pilot project for TACC, the Federal Government of Nigeria will apply the lessons learned and best practices developed by this programme in Delta State to other regions in Nigeria as well as to other regions globally.
6. Considering the above context, the government of Delta State of Nigeria is playing a pioneering role by adopting a Territorial Approach to Climate Change (TACC). This Delta State TACC programme (hereafter referred to as ‘the TACC programme’) aims to lay the foundation for the development of a low emission economy and climate-resilient local economic development within Delta State of Nigeria, which ensures sustainable energy, food security, robustness of infrastructure services and the creation of clean jobs and economic opportunities. This is in accordance with the aim of the Nigerian Federal government to make Nigeria carbon neutral by 2025[[3]](#footnote-3), and in addition, to the aim of the private sector to be carbon neutral by 2020[[4]](#footnote-4). Furthermore, the TACC programme is being initiated at a critical time in the development of Delta State economy, as Delta State has a major focus on infrastructure development, and plans to invest 95 % of its budget on this until 2020[[5]](#footnote-5). If TACC can assist in mainstreaming both GHG mitigation and adaptation concerns into this economic drive, it will significantly contribute towards ensuring a more resilient economy in the long term. Additionally, TACC can be seen as a lever for promoting cross-sectoral dialogue for more effective long-term economic and development planning. Ultimately, based on its success, the proposed TACC programme will be applied across Nigeria and hence the national context as well as the regional context is presented in the sections to follow.
7. Through TACC, Delta State can improve the availability of sustainable livelihoods through local economic development, and increase access to basic services such as sustainable energy sources and access to economically feasible products. It can also assist in renewing the agricultural economy and the ecosystems upon which local communities rely upon for food and social security, through re-empowerment and capacity development. In order for Delta State to effectively become climate change-resilient, the baseline environment and ecosystems need to be functional in order to support ecosystem services. So as to ensure that this occurs, Ecosystem-Based Adaptation (EBA) should be a major part of the overarching adaptation drive within Delta State.

## National Context

1. The Federal Republic of Nigeria (hereafter Nigeria) is situated on the Gulf of Guinea (see Figure 1), covering an area of approximately 924,000 km2 (land: 911,000 km2 and water: 13,000 km2) with an 853 km long coastline[[6]](#footnote-6).
2. Nigeria signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, and ratified the UNFCCC in 1994 and is a Non-Annex 1 party to the convention. Additionally, Nigeria ratified the Kyoto Protocol in December 2004. Consequently, the Nigerian First National Communication (2003) has been developed and the country’s Second National Communication is presently under development.

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| Map of Nigeria |  |
| **Figure 1**: Map of Nigeria[[7]](#footnote-7). | **Figure 2**: Map of Nigeria showing the states within the Niger Delta (shaded area)[[8]](#footnote-8). |

**The Biophysical Environment**

*Climate*

1. Nigeria's climate is characterized by strong latitudinal zones. The country becomes progressively drier as one moves north from the coast[[9]](#footnote-9). In general, Nigeria experiences a warm tropical climate with a mean temperature of 27 °C[[10]](#footnote-10), with diurnal variations more pronounced than seasonal variations. The climatic condition varies from equatorial in the south, tropical in the centre and arid in the north[[11]](#footnote-11). Rainfall is the key climatic variable, with total annual rainfall ranging from over 4000 mm in the south-east along the coast[[12]](#footnote-12) to less than 400 mm in the north[[13]](#footnote-13).

*Drainage systems*

1. The three major drainage systems in Nigeria are[[14]](#footnote-14): i) the Niger River drainage system; ii) the coastal drainage system; and iii) the Lake Chad inland drainage system. The Niger River drainage system consists of the Niger River and its tributaries, which include *inter alia* the Benue, the Sokoto-Rima, the Kaduna, the Gongola and the Anambra. The coastal drainage system consists of two sub-sets and is made up of rivers and streams that drain directly into the Atlantic Ocean. The two sub-sets are: i) the eastern system consisting of rivers and streams east of the Niger Delta such as the Cross, Imo, Qua Iboe and Kwa rivers; and ii) the western system, which consists of the Benin, Ogun, Oshun and Owena rivers. The Lake Chad inland drainage system in Nigeria consists of the Komadougou-Yobe and the Yedseram rivers, but the most important inflow is from the Chari and Lagone rivers in the Central African Republic. Important drainage systems within Delta State also include the Forcados River, the Ethiope River and the Nun River.

*Vegetation and biodiversity*

1. There are three main vegetation types in Nigeria[[15]](#footnote-15): i) the Guinea and Sudano-Sahelian savannah in the north; ii) the mangroves and freshwater swamps along the coast, where the country’s fisheries resources are concentrated; and iii) the rainforests in the south. Between the rainforest and the Guinea savannah is a modified vegetation transition, consisting of light deciduous forest and derived savannah. The Niger Delta has the largest area of mangrove swamps in Africa, spanning approximately 1,900 km2.Mangroves and rainforests constitute the country's main sources of wood. Nigeria’s biodiversity is a large source of pharmaceuticals. It also provides a sustainable source of genetic materials for improving food production potential. However, due to various anthropogenic pressures, all three of Nigeria’s vegetation types have been severely degraded and fragmented[[16]](#footnote-16).

*Environmental concerns*

1. Nigeria is faced with a number of pressing environmental problems. The Sahara Desert to the north is advancing at a rate of 600 m per annum, while sea level rise (SLR) threatens low-lying delta regions in the south of the country[[17]](#footnote-17). In 2005, Nigeria was identified to have the highest rate of deforestation in the world (losing 56 % of its primary forests over the period 2000 – 2005)[[18]](#footnote-18), and is listed in a worldwide assessment as having the third largest average annual net forest loss (-3.7 %) over the period 2000 - 2010[[19]](#footnote-19). Oil pollution is also a severe environmental problem in Nigeria. In 2006, an estimated 1.5 million tons of oil had spilled in the Niger Delta ecosystem over the past 50 years[[20]](#footnote-20),[[21]](#footnote-21), the equivalent of one Exxon Valdez spill annually. The implications of these oil spills are alarming, particularly their consequences for[[22]](#footnote-22): i) soil contamination; ii) marine and freshwater organism mortality and consequent food chain disruption; iii) contamination of commercially valuable fish; iv) negative impacts on fish hatcheries; and v) contamination of drinking water. Gas flaring is associated with the oil industry, and is another large contributor to Nigeria’s environmental problems. Between 1990 and 2000, Nigeria reportedly flared 75 % of the gas it produced[[23]](#footnote-23). In 2005, 46 million tons CO2 was released through flaring[[24]](#footnote-24). Gas flaring releases methane and other GHGs into the atmosphere, which not only contributes to global warming, but also negatively impact on human health in surrounding areas, and reduces crop yield[[25]](#footnote-25). Rapid urbanization[[26]](#footnote-26) (see paragraph 14), also contributes to environmental concerns within Nigeria as does inadequate urban waste management. These environmental problems have a number of adverse consequences, including *inter alia*: i) air, water and soil pollution[[27]](#footnote-27); ii) desertification in the extreme northern parts of the country; iii) loss of arable land through gully erosion and soil degradation; and iv) increased health risks. In addition they can contribute towards poverty, restlessness amongst the youth and environmentally induced conflicts.

***The socio-economic environment***

*Population and urbanization*

1. Nigeria’s population is estimated at approximately 140-150 million people, with an annual growth rate of 2 %, making it the most populous country in Africa and the eighth most populous country globally[[28]](#footnote-28). However, the growth rate in the country is lower than expected due to a high mortality rate largely as a result of the HIV/AIDS pandemic[[29]](#footnote-29) but also due to poverty, hunger and other diseases such as malaria. As a result, the population’s average life expectancy is 47 years with a median age of 19 years. Approximately 48 % of the total Nigerian population is concentrated in urban areas and the country’s urbanisation rate is considered high at 3.8 % annual rate of change[[30]](#footnote-30). In addition, more than 70 % of the population are considered poverty-stricken[[31]](#footnote-31). Poverty reduction remains a major challenge to the Federal Government of Nigeria (FGN). More than 15% of the labour force is unemployed, with university graduates and the rural populace being the most affected[[32]](#footnote-32). Poverty reduction is a challenge for the FGN, firstly because productivity in economic sectors has been saturated. This stunts the development of a diversified, private-sector-driven economy, a tax-paying citizenry and strong and independent civic institutions. Secondly, the State has not yet realized its full potential for promoting social and economic transformation due to a lack of transparency and accountability in governance, resulting in poor returns from public expenditure[[33]](#footnote-33). Consequently, the population has become more dependent on the already dwindling natural resources (e.g. water, land and forests).
2. The 2006 Nigerian MDG report[[34]](#footnote-34) indicates that there is a likelihood of achieving only three of the eight MDGs namely: i) Goal 2 “Achieve Universal Primary Education”; ii) Goal 7 “Ensure Environmental Sustainability”; and iii) Goal 8 “Develop a Global Partnership for Development”. There is very little progress in other areas such as the health-related MDGS (e.g. access to safe water and sanitation)[[35]](#footnote-35). A critical barrier to planning for achievement of the MDGs is the lack of current data on most of the indicators, a situation which is further compounded by the limited funding available for data generation and management[[36]](#footnote-36).

*Commerce and industry*

1. Nigeria is an active member of New Partnership for Africa Development (NEPAD), the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (UEMOA)[[37]](#footnote-37). Due in part to its large population, Nigeria presents a very important market in Africa. Indeed, Nigeria accounts for 60 % of West Africa’s GDP[[38]](#footnote-38) and its development and successes are therefore regionally very important. The two main industrial sectors in Nigeria are crude oil extraction and solid mineral mining[[39]](#footnote-39). However, the country’s economy is based predominantly on the petroleum industry, which has resulted in industrial capacity doubling from 29 % in 1999 to 60 % in 2003[[40]](#footnote-40). Nigeria is ranked the sixth-largest producer of crude oil in the Organisation of the Petroleum Exporting Countries (OPEC). The country’s oil reserve is estimated at 32 billion barrels, mainly in Delta State (south-eastern and southern coastal area) and the natural gas reserve is estimated at 174 trillion cubic feet. Other industries include: rubber products, wood, textiles, cement and other construction materials, food products, footwear, chemicals, fertilizer, printing, ceramics, steel, hides and skins.
2. As Nigeria is rich in energy resources[[41]](#footnote-41), it is also one of the highest emitters of greenhouse gases (GHGs) in Africa, albeit lower than the global average. Energy consumption processes (notably gas flaring, electricity generation, biomass burning and transportation); land use change, industry, solvent use, agriculture and waste management emit approximately 218 million tonnes of GHGs[[42]](#footnote-42), which significantly contribute to global climate change and other local environmental problems[[43]](#footnote-43). For example, 80 % of all natural gas produced is flared and only 20 % is captured for energy use[[44]](#footnote-44). The GHGs emitted into the atmosphere result in localised acid rain in Nigeria, which has adverse effects on: i) water resources (lakes and streams become acidified); ii) agriculture (crops are damaged, reducing agricultural yields[[45]](#footnote-45)); iii) health (increased premature deaths, increased risk of respiratory illnesses and often causing cancer, blindness, impotency and miscarriages[[46]](#footnote-46)); iv) property (zinc-plated roofing sheets are corroded[[47]](#footnote-47),[[48]](#footnote-48)); and v) natural ecosystems (resulting in the loss of biodiversity).

*Agriculture*

1. Agriculture, which is predominantly rain-fed, is Nigeria’s second-largest source of national wealth after oil. It is the dominant economic activity in terms of employment and linkages with the rest of the economy[[49]](#footnote-49). Approximately 75 % of the country’s land is arable, of which about 40 % is cultivated. The main agricultural products include: cocoa, peanuts, cotton, palm oil, corn, rice, sorghum, millet, cassava (tapioca), yams, rubber, cattle, sheep, goats, pig, timber, and fish. Cocoa and rubber are export crops and together account for nearly 60 % of non-oil product exports.

*Health*

1. It is estimated that 2.6 million people in Nigeria are HIV positive[[50]](#footnote-50).The number of people living with HIV/AIDS is the second largest in the world, despite a reduction in the national prevalence rate to 4.4 %[[51]](#footnote-51).Urban congestion, drought and pollution from industrial and other development activities have also led to the increased frequency of other diseases. It is believed that inadequate and poor water quality account for the increasing incidence of typhoid, cholera and malaria in the country[[52]](#footnote-52). GHGs and other toxins emitted through gas flaring have also adversely affected the health of the Nigerian population (see paragraph 17).

*Governance and development*

1. Since the emergence of democratic governance in 1999, Nigeria has made advances in national economic management and a deepening democratic process. Through extensive consultations, the first Integrated Poverty Reduction Strategy Paper (PRSP), better known as the National Economic Empowerment and Development Strategy (NEEDS), was developed[[53]](#footnote-53). The main objective of NEEDS was to consolidate government achievements of the previous four years and lay a solid foundation for sustainable poverty reduction, employment generation and wealth creation in the country. The state governments have also developed State-level Economic Empowerment and Development Strategies (SEEDS).
2. The new democratic regime also resulted in the Seven Point Agenda[[54]](#footnote-54) of the President, which outlined the main areas of focus of his regime, namely: i) power and energy; ii) food security; iii) wealth creation; iv) transport; v) land reforms; vi) security, particularly in the Niger Delta; and vii) education. A longer-term perspective has also been introduced into the country’s development planning through the emergence of Vision 2020: “By 2020 Nigeria will be one of the 20 largest economies in the world able to consolidate its leadership role in Africa and establish itself as a significant player in the global economic and political arena”[[55]](#footnote-55). The integration of NEEDS and the Seven Point Agenda into a National Development Plan (NDP) comprises the first medium-term plan to implement Vision 2020. Vision 2020 has two broad objectives over the medium- to long-term, namely: i) to optimise human and natural resource potentials to achieve rapid and sustained economic growth; and ii) to translate economic growth into equitable social development[[56]](#footnote-56). Given the implications that climate change is likely to have on Nigeria’s development objectives, it should be considered a top government priority.

## Regional Context: Delta State

***The Biophysical Environment***

1. The Niger Delta is located in the Atlantic Coast of southern Nigeria where the Niger River divides into numerous tributaries[[57]](#footnote-57) (Figures 1 and 2). The entire Niger Delta cuts across nine states in southern Nigeria[[58]](#footnote-58) (Figure 2). The delta coastline stretches some 450 km and the delta itself covers some 20,000 km2, making it the second largest in the world[[59]](#footnote-59), and Africa’s largest wetland[[60]](#footnote-60). Delta State (Figure 3)[[61]](#footnote-61), which covers 17,698 km2, constitutes one of the nine states in the Delta Region.



**Figure 3:** Map of Nigeria indicating Delta State(indicated in red) of the Niger Delta.

*Climate*

1. The climate of Delta State varies from hot equatorial in the southern lowlands to humid tropical in the northern highlands, and cool montane in the Plateau area[[62]](#footnote-62). There are two distinct seasons, namely: the relatively long wet season (March to October) and the dry season (late November to March). The dry season is usually characterized by harmathan[[63]](#footnote-63) (in December or January) due to the northeast trade wind which blows over the Sahara desert and has a drying and cooling influence on Nigeria. The mean annual rainfall ranges from over 4000 mm in the coastal areas to 1500 mm inland. Mean annual temperatures range from 21 ºC to 33 ºC. Being a delta with numerous tributaries and mangrove swamps, Delta State is characterised by annual flooding.

*Vegetation and biodiversity*

1. Delta State consists of five ecological zones, namely: i) coastal and barrier forest ; ii) mangrove forest; iii) freshwater forest; and iv) inland humidforest.. These different ecological zones support a wide variety of aquatic and terrestrial species, making the Niger Delta the richest wetland in the world in terms of biodiversity[[64]](#footnote-64). The mangrove swamps in the Niger Delta are the largest in Africa[[65]](#footnote-65), extending approximately 1,900 km2. The delta is home to numerous IUCN red list species[[66]](#footnote-66), including three species of endangered sea turtle, the Elephant and the Niger Delta pigmy hippopotamus.

*Environmental concerns*

1. Uncontrolled anthropogenic actions have adversely impacted environmental integrity of the Niger Delta region and in so doing, have reduced the efficacy of the delta to serve as a natural buffer system to anticipated climate change impacts (such as increased storm activity, see paragraph48 and 59).Primary threats to Delta State include[[67]](#footnote-67) i) oil and gas related pollution; ii) development that is not ecologically sound; iii) inappropriate water regime management; iv) uncontrolled agricultural expansion; and v) overharvesting of natural resources. Mangroves are threatened by deforestation for fuelwood, mining, industrial activity, pollution from oil spills and invasion by Nypa palm[[68]](#footnote-68),[[69]](#footnote-69)). Mangroves are commonly felled for fuelwood to aid fish smoking, leaving mudflats exposed for Nypa palm invasion, which prevents re-establishment of mangroves[[70]](#footnote-70). Nypa palms further adversely impact the delta system as their short root systems allow for destabilization of river banks and consequent increased siltation[[71]](#footnote-71). Mangrove decline and deforestation is of significant concern, as mangrove ecosystems are highly productive and play an essential role in the survival of numerous fish species and other marine organisms. For example, they serve as spawning or nursery grounds for several commercially important fish species. Intact mangrove forests also play an essential role in protecting the coastline in that they act as a resilient buffer zone against tropical cyclones, strong winds, storm surges and tidal activity, thereby reducing coastal erosion[[72]](#footnote-72), and are thus recognised as effective buffer systems against climate change-related sea level rise (SLR), increased cyclonic activity and storm surges. Freshwater, including wetlands, in Delta State is threatened by oil spills (see paragraph 17) from pipeline leaks as well as mining activities[[73]](#footnote-73), coupled with being inherently vulnerable to flooding (both as a result of coastal inundation and increased river levels) due to the low-lying terrain of the delta[[74]](#footnote-74).Gas flaring in Delta State not only releases methane and other GHGs into the atmosphere (see paragraph 17) causing environmental and health risks, but it is also reported to cause environmental pollution by altering the thermal equilibrium[[75]](#footnote-75), increasing temperatures around the flaring site by up to 3.7°C. Oil spills in Delta State damage both aquatic and terrestrial ecosystems, resulting in: i) severe bush burning; ii) pollution and death of aquatic life in affected rivers; iii) contamination of water used by communities for drinking and domestic use[[76]](#footnote-76), and iv) contamination of farmland sediment.
2. Delta State is already experiencing climate change-related phenomenon such as increased temperature (including seasonal changes), an increased frequency in heat waves, increased frequency and intensity in storms, SLR, increased flooding, and more extreme rains including seasonal changes[[77]](#footnote-77). These changes are having a detrimental effect on the sustainability of the biodiversity resource base as well as on the communities whose livelihoods depend on these natural resources. In addition to these anthropogenic-induced impacts, climate change will likely further impact on mangroves and wetlands through SLR and saline intrusion (see paragraph 34 and 59), this will consequently alter the salinity of the estuarine waters on which mangroves depend. Climate change will also further reduce the capacity of freshwater bodies such as marshes to retain water and act as CO2 sinks[[78]](#footnote-78).

***Socio-economic environment***

*Demographics*

1. Since its creation in 1991[[79]](#footnote-79), the population of Delta State has grown by an estimated 1.2 million people to 3.7 million people in 2005[[80]](#footnote-80). This population comprises the following ethnic groups: the Igbos, Urhobos, Ijaws, Isokos, and the Itsekiris[[81]](#footnote-81).

*Economic drivers*

1. As a result of its rich oil and gas reserves, the main economic sector of both Delta State and the whole of Nigeria is the oil sector. This sector contributes as much as 40 % to the country’s GDP and 83 % to total government revenue, and comprises 95 % of the country’s export earnings[[82]](#footnote-82). However, despite the importance of the oil industry, Delta State is predominantly an agrarian state and the traditional economic activities of the local population include farming, fishing, timber and rubber production, trading and collection and processing of palm fruits and forest resources (such as game and raffia).
2. Although agriculture is a major economic activity, much indigenous knowledge has been lost since the arrival of the oil sector, as a result of men moving into industrial sectors or to urban centres. Consequently, mainly slash and burn agriculture is practiced in Delta State[[83]](#footnote-83) and where fertilizer is appliedmostly in the north of Delta State, it is done with little understanding and often in a blanket fashion[[84]](#footnote-84). Artisanal fishing is also an important economic livelihood in Delta State. However, fish stocks are declining, largely due to environmental degradation. Overall, excessive human pressure (especially activities of oil exploration and exploitation) on the natural resource base has led to the depletion of biodiversity in the region. Despite the success of the oil industry, the level of poverty, unemployment, intercommunity conflict, conflict over land, housing pressure and crime are very high in the Niger Delta[[85]](#footnote-85).

*Governance structure*

1. The Niger Delta consists of nine states, each administered by a Governor. Each of the states in the Niger Delta region has three Senatorial districts totalling twenty seven. The Niger Delta region comprises six Senatorial districts[[86]](#footnote-86). Each state is further divided into local government areas (LGA), administered by a Local Government Council consisting of a chairman who is the Chief Executive of the LGA, and other elected members (Councillors). Each LGA is further subdivided into at least 10 wards (at most 15 wards).
2. In 2000, President Olusegun Obasanjo created the Niger Delta Development Commission (NDDC), a Federal Government Agency (FGA) mandated to serve the interests ofthe Niger Delta. In September 2008, late President Umaru Yar’Adua announced the formation of a Niger Delta Ministry, with the NDDC as a parastatal under the ministry[[87]](#footnote-87).

## Climate Change Context (National):

***Observed climate change variability, trends and impacts in Nigeria***

1. The following impacts of climate change are already apparent across Nigeria:
* an increase in the mean annual temperature of 1.7 °C between 1901 and 2005[[88]](#footnote-88);
* coastal erosion in the states within the Niger Delta due to SLR[[89]](#footnote-89);
* an increase in the variability in total annual rainfall;
* an increase in flood events in the southern coastal states due to increased rainfall; and
* an increase in drought episodes and subsequent desertification in the northern states[[90]](#footnote-90).
1. The increase in mean annual temperature over the past century across Nigeria has been variable with an increase of 1.2 °C in the coastal cities of the Niger Delta and an increase of 2 °C in northern Nigeria[[91]](#footnote-91). The rise in temperature has resulted in increases in evapotranspiration rates as well as in the frequency and intensity of heat waves and droughts. Overall, this has resulted in a reduction in soil water content as well as surface and ground water resources, which has had consequent adverse impacts for agricultural crop and livestock production across Nigeria[[92]](#footnote-92).
2. A mean SLR of 0.46 m was recorded between 1960 and 1970 at the Niger Delta coast7. Due to continued sea level rise, salt water intrusion of the low-lying areas of the Niger Delta region has been observed, including a flooding of salt water into the coastal plain covering an area of approximately 3,400 km2 ([[93]](#footnote-93)). This has led to widespread coastal erosion, which poses a threat to the economic activities within the Niger Delta, particularly agriculture and fisheries (approximately 50 % of the fishes consumed in Nigeria are from the Niger Delta), as well as human lives, communities and infrastructure. Additionally, coastal erosion is a significant threat to the oil industry as a result of damage to infrastructure (e.g. oils wells). Furthermore, SLR has led to salt water intrusion into freshwater resources (both surface and groundwater sources), which has led to increasing salinity, and a reduction of freshwater resources for both agricultural and domestic purposes[[94]](#footnote-94). The coastal-dwelling Nigerian population have been particularly affected as they rely on groundwater sources as their main supply for domestic use (including drinking). In addition, SLR has impacted on aquatic biodiversity, particularly important mangrove forests, by altering the salinity content of the estuarine waters. The Niger Delta has the largest area of mangrove forests in Africa, spanning approximately 1,900 km2. The observed SLR has had a negative impact on the aquatic biodiversity of this ecosystem due to the limited salinity tolerance range of the plants[[95]](#footnote-95).
3. Meteorological data have shown that rainfall patterns in Nigeria have changed since the 1960s. Overall, there has been an average increase in the amount of rainfall in coastal areas (which has led to sporadic flooding), and a decline in the amount of rainfall in the interior, and changes in the length and timing of the rainy season in both regions. Northern states, for example, are currently receiving less than 75 % of their annual rainfall[[96]](#footnote-96),[[97]](#footnote-97), leading to droughts. The expected rainfall periods have also changed. The agriculture sector in Nigeria is highly sensitive to changes in rainfall patterns, particularly in southern Nigeria where rain-fed agriculture is mainly practiced and crops are seldom irrigated. Farmers time the cultivation and planting of their crops according to the end of the dry season (November to March) and beginning of the wet season (April to October). Due to the change in rainfall patterns, farmers who plant after the first or second rains incur economic losses when the rains are delayed beyond what is expected. The increased variability in rainfall is therefore a threat to food security and local economies.
4. The increased rainfall in the southern region of Nigeria has lead to an increase in flood events. In recent times, flood disasters have occurred in Oyo (1985, 1987 and 1990), Osun (1992, 1996, 2002) and Ondo States (1996, 2000, 2002, 2004 and 2006) and the coastal cities of *inter alia* Lagos, Ogun, Port Harcourt, Calabar, Uyohave experienced flooding.Flood incidents within Delta State have included Warri, Effurun, Uzere, Agbarho, Ughelli, Sapele, Asaba, Out-Jeremi, Oginibo, and Igbodo. Apart from extensive soil erosion, flooding waters have claimed many lives, destroyed infrastructure, damaged crops, polluted freshwater sources (with sediment and waste from industrial and development sites) and increased the vulnerability of the local population to various waterborne diseases such as malaria, diarrhoea, cholera and typhoid fever. Aquatic biodiversity within the mangrove swamps of the Niger Delta has also been affected by the influx of fresh, sediment-laden water, thereby decreasing salinity and increasing turbidity.
5. The increased temperature and decreased rainfall in the northern region of Nigeria have resulted in increased evapotranspiration, drought and desertification. The drier north of the country supports approximately 90 % of the cattle population, 60 % of the goats and sheep and almost all the donkeys, camels and horses, as well as most of the export crops (such as cotton and groundnuts) and food crops such as rice and wheat. This region is inherently prone to frequent and sometimes intense periods of drought, notably the 1972-1974 drought, which has been described as one of the worst droughts experienced in West Africa[[98]](#footnote-98). During drought, the land is under increased stress from both humans and livestock. Over-extraction of groundwater sources has lead to a lowering of the water table (a decline of 6.5 m in the mean groundwater level was, for example, measured from a concrete well in Borno State between 1963 and 1972), and land is overgrazed by livestock, with periods of fallow reduced to a minimum[[99]](#footnote-99). These factors lead to environmental degradation, which combined with the depletion of soil moisture content and soil fertility through wind erosion, can lead to desertification. It has been estimated that between 50 % and 75 % of Bauchi, Borno, Gombe, Jigawa, Kano, Katsina, Kebbi, Sokoto, Yobe, and Zamfara States in Nigeria, accounting for approximately 38% of the country’s total land area and with a population of 27 million people, is being affected by desertification. There is a tendency for the population of these states to migrate with their livestock to states further south (central states), such as the Federal Capital Territory, Plateau, Adamawa, Taraba, Niger, Kwara and Kaduna states. This migration further intensifies the use of the fragile and marginal ecosystems resulting in 10-15 % of the land in these central states being threatened by desertification at present. Climate change impacts, particularly anticipated increases in temperature and decreases in rainfall, are likely to exacerbate existing rates of desertification.

***Climate change projections and predicted impacts in Nigeria***

1. Africa is predicted to experience greater climate variability than the globally predicted trends. To date, for example, temperatures in West Africa and particularly the Sahel region which northern Nigeria forms part of, have increased more sharply than the global average since the 1970s[[100]](#footnote-100). It is predicted that over the next century, average temperatures in West Africa will rise by between 3°C and 4°C, which is more than 1.5 times the average global trend[[101]](#footnote-101).
2. Climate change predictions for Nigeria include the following:
* an increase in mean annual temperature of 3.2°C by 2050 under the high climate change estimate (based on the IPCC climate change assumptions, latest research findings and results of a consultation exercise in Nigeria)[[102]](#footnote-102), and of 0.4-1.0 °C under the low climate change estimate;
* a rise in sea level of 0.3 m by 2020 and 1 m by 2050 under the high climate change estimate (from 1990 sea level; based on the same findings as above), and of 0.1 m and 0.2 m over the same time periods under the low estimate. A 1 m rise in sea level will result in the loss of 75 % of the Niger Delta[[103]](#footnote-103) and the inundation of approximately 660 communities with a population of 1.2 million, as well as the displacement of a further 2-3 million people from flood erosion due to the intruding salt water[[104]](#footnote-104);
* an increase in the frequency and intensity of extreme weather events such as floods, droughts and heat waves[[105]](#footnote-105); and
* changes in rainfall pattern (timing and intensity)[[106]](#footnote-106), with an increase in mean annual rainfall of 8- 20 mm per year by 2050cc[[107]](#footnote-107).
1. The above listed climate change impacts will have severe knock-on effects on various sectors such as: i) health; ii) water; iii) energy; iv) agriculture; v) fisheries; and vi) tourism, which are described below.

*Health*

1. The health sector of Nigeria is likely to be undermined by climate change impacts. The increase in frequency and intensity of extreme weather events such as floods, droughts and heat waves, for example, will increase the vulnerability of the affected communities by preventing access to basic needs such as clean water, food, shelter and health care facilities[[108]](#footnote-108). Nigerian communities are affected by numerous food and water-borne diseases (e.g. diarrhoea, hepatitis and typhoid fever), vector-borne diseases (malaria and yellow fever) and respiratory diseases such as meningococcal meningitis. The prevalence of these diseases is expected to increase as a result of climate change[[109]](#footnote-109) through increased temperatures and rainfall (resulting in wetter and warmer conditions conducive to the spread of vector-borne diseases) and the contamination of freshwater domestic use supplies through flooding (leading to the spread of water-borne diseases).

*Water*

1. The water sector will be impacted by both changes in rainfall pattern and an increase in salt water intrusion in coastal areas. The amount of rainfall is predicted to increase in the southern region of the country, and rainfall events are likely to become more intense (i.e. leading to flooding) with potentially destructive consequences for communities, infrastructure and natural ecosystems. Due to the predicted salt water intrusion into coastal surface and groundwater resources as a result of SLR and the expected decrease in rainfall in the northern region of the country, the supply of potable water is expected to decrease county-wide. Furthermore, Nigeria is the most populous country in Africa with an annual growth rate of 2 %[[110]](#footnote-110). This population growth and concomitant decrease in potable water supply is expected to create significant problems to development in Nigeria in the future. Indeed, water demand is expected to be double supply by 2030[[111]](#footnote-111). The consequential decline in water security will also have significant adverse effects on all sectors listed, and the socio-economic stability of the region.

*Energy*

1. Energy production within Nigeria is dominated by two forms, namely hydroelectric and thermoelectric power generation[[112]](#footnote-112). Hydroelectric power generation accounts for approximately half of Nigeria’s energy. Climate change impacts, specifically through a reduction in rainfall leading to reduced river flow and an increase in temperature resulting in increased evaporation from reservoirs, will result in a reduction in the hydro-electric potential. Indeed, fluctuations in the water level of the Kainji Dam (Niger State, North-centralNigeria) as a result of climate variability are already disrupting electricity generation from the hydropower station[[113]](#footnote-113). Other impacts on the energy sector may be a reduction in the availability of fuelwood as an energy source due to the effects of climate change, i.e. a hotter and drier climate in the north decreasing tree growth, and an inundation of coastal areas in the south affecting coastal trees. The migration of communities (see paragraph37) will concentrate the demand for fuelwood in the central and southern regions, thereby further depleting fuelwood sources in these areas. Additionally, the majority of energy production facilities (e.g. power, oil and gas plants) are located along the coastal areas of Nigeria and will be negatively affected by predicted SLR through inundation and damage to infrastructure[[114]](#footnote-114).

*Agriculture*

1. Agriculture is the main source of food and employment to 60-70 % of Nigerians. It is of particular importance in rural areas where subsistence agriculture is practiced[[115]](#footnote-115). As a result of drought and desertification in the northern region as well as intrusion of salt water into coastal areas, it is estimated that approximately only half of the 71.2 million hectares of available agricultural land is currently utilized[[116]](#footnote-116). Under drought conditions, agriculture is less productive. For example, during the 1972-1974 drought in the northern region local farm yields dropped by 60 %[[117]](#footnote-117). The predicted impacts of climate change will affect the agriculture sector in the northern region of Nigeria through reduced rainfall and increased temperature, leading to a decrease in rain-fed irrigation of crops and pastureland, lowering of soil water content, a decline in the surface water availability for livestock and an increase in the salinity of water sources through increased evaporation. In the southern region, an increase in the frequency and intensity of extreme weather events such as floods will impact agriculture through the loss of land as a result of erosion and flooding, while SLR will increase the salinity of inland waters and result in salt water intrusion of low-lying coastal areas thereby affecting crop growth. Additionally, SLR will result in coastal inundation and reduce land available for agriculture. Changes in the timing of the onset of the rainy season will also affect farmers (see paragraph35). These climate change associated problems are expected to increase due to increasing floods and SLR in the south and desertification from increased temperatures and decreased rainfall in the north, with detrimental impacts on food security, livelihoods and economic development.

*Fisheries*

1. Fisheries are of critical importance within Nigeria as they provide both a major source of food and employment. Inland, ocean and coastal fisheries stand to be affected by increases in water temperatures, potentially rendering current fisheries unproductive. For example, increased ocean temperatures are predicted to affect coastal upwelling along the Gulf of Guinea and disrupt the supply of nutrients to fisheries. The intrusion of salt water into rivers, lakes and mangrove forests due to SLR, as well as the inflow of sediment-laden waters into the coastal area as a result of flooding, will also adversely affect the coastal fisheries.

*Tourism*

1. The tourism sector is one of the fastest growing industries in Nigeria and is based largely on wildlife tourism, nature reserves and coastal resorts[[118]](#footnote-118). Many of Nigeria’s tourist attractions are located along the coast. Predicted SLR will impact these resorts through inundation and damage to property and infrastructure linking costal resorts to major cities. The anticipated loss of wildlife due to reduced vegetation in nature reserves from increasing temperatures and decreasing rainfall in the north will discourage tourism, reducing revenue from this sector. Furthermore, traditional festivals, a popular tourist attraction, stand to be affected as many rely on rivers and rainfall[[119]](#footnote-119).

## Climate Change Context (Regional):

1. Being a coastal region with low-lying terrain criss-crossed by a number of waterways, the Niger Delta area and Delta State in particular are highly susceptible to a number of climate change impacts[[120]](#footnote-120). The sustainable use of natural resources will be compromised, as will the income earning potential of the land and on the communities whose livelihoods depend on the resources[[121]](#footnote-121). The threats that climate change (both current and future) pose to development efforts in Delta State are outlined in this section.

*Observed climate change variability, trends and impacts in Delta State*

1. Delta State is currently experiencing climate change-related impacts, which include:
* an increase in temperature and frequency of heat waves;
* an increase in the frequency and intensity in storms;
* more extreme rains, including seasonal changes, leading to flooding and increased erosion and landslides; and
* SLR and coastal inundation.
1. The Niger Delta area and Delta State in particular are also faced with other environmental problems resulting from oil exploration and exploitation activities. These contribute to and exacerbate existing and predicted impacts of climate change by reducing environmental resilience and therefore the ability of the natural environment (and those that depend on it) to cope with the changes listed above. In order to build environmental resilience, environmental problems have to be attended to. Problems include the following[[122]](#footnote-122):
* bush fires;
* the emission of GHGs predominantly through gas flaring; and
* oil spills.
1. The above listed climate change impacts and environmental problems already exert a strong influence on the day-to-day economic development of Delta State, particularly in terms of: i) health; ii) water; iii) energy; iv) infrastructure; v) food security; vi) fisheries; vii) ecosystems; and viii) livelihoods[[123]](#footnote-123),[[124]](#footnote-124). These sectors are discussed below.

*Health*

1. In addition to the health impacts of a warmer and wetter climate predicted for the southern region explained in paragraph41 (i.e. spread of vector- and water-borne diseases), gas flaring in Delta State emits GHGs and other gases that result in acid rain. In 2005 gas flaring in Nigeria was responsible for the emission of 46 million tons of carbon dioxide into the atmosphere[[125]](#footnote-125). Sulphur dioxide and nitrogen oxides are emitted in addition to carbon dioxide. These gases combine with atmospheric moisture to form acid rain, with resultant health implications such as increased risk of heart and lung disorders, including asthma, bronchitis and emphysema[[126]](#footnote-126). These health hazards are expected to worsen due to increased rainfall as a result of climate change, and be exacerbated by the damage of healthcare infrastructure due to floods and storms.

*Water*

1. The threat of salt water intrusion affecting water sources in the coastal region (i.e. Delta State) and the effect of flooding, the resultant sedimentation and pollution of water sources has been described in paragraphs and. Furthermore, acid rain has acidified lakes and streams in the Delta region with detrimental effects on aquatic life. This has indirectly impacted on the quality of drinking water as the lowered pH of the water sources in Delta State can alter the chemistry of the water, resulting in metals such as lead and aluminium (washed into the water from floods and resultant erosion) becoming toxic[[127]](#footnote-127).

*Energy*

1. The energy sector has been affected by climate change through flooding of oil wells due to SLR. For example, in Ogulagha, Delta State, the problem of flooding oil wells dates back to 1983 when eight wells were flooded. Persistent erosion and rising sea levels since then have resulted in number of wells being submerged[[128]](#footnote-128). The problems are expected to worsen with the predicted SLR. Furthermore, the increased intensity of storms has destroyed electricity poles, resulting in blackouts. Excessive rainfall has also caused scarcity in fuelwood due to flooding of collection areas.

*Infrastructure*

1. Flooding has resulted in damage to infrastructure affecting access routes to coastal areas in Delta State, for example, the communities of Oko-Amakom, Oko-Anala, Oko-Gbele, and Oko-Odifuluare all regularly cut off due to flooding. The increase in rainfall and in frequency and intensity of severe rain and flooding events has damaged infrastructure, resulted in the limited availability of public transport, increased the cost of transportation and damaged properties[[129]](#footnote-129). In addition, Delta State residents have complained of damage to corrugated roofs as a result of corrosion due to acid rain[[130]](#footnote-130).

*Food security*

1. Agriculture in Delta State is predominantly rain-fed, and therefore vulnerable to the impacts of climate change related hazards. Crop yields have been reduced through crop damage from flooding, farming activities have been disrupted by damage to market access roads and farmers’ income has been reduced. These factors have lead to a decrease in food security. Furthermore, the area of arable land and soil fertility has been reduced by both salt water intrusion into agricultural fields and erosion with resultant landslides. For example, landslide occurrence has contributed to a loss of a length of 300 m of terrestrial land adjacent to the Niger River between 1970 and present date[[131]](#footnote-131), while the Abari community in Patani has lost 30 km of riverbank land. In addition to the effects of flooding, excessive heat between March and May has resulted in the scorching of crop in the last decade[[132]](#footnote-132).

*Fisheries*

1. The coastal fisheries sector in Delta State is already severely undermined due to the degradation of mangrove forests resulting from human pressure (e.g. collection of fuelwood) and coastal erosion due to SLR, as detailed in paragraph45. The situation is exacerbated by the pollution of rivers, streams and estuaries through oil spills and from inland industrial waste washed downstream by increased river flow from excessive rainfall. This has resulted in decreased oxygen content of the polluted water bodies, which has impacted negatively on fish populations and thus fish catch. For example, it has reported that the abundance and range extent of fish species such as *Gynnarchus niloticus* have reduced in Uzere, Delta State, and may become extinct in the near future[[133]](#footnote-133). Increases in marine and freshwater temperature also cause stress on the fish populations, leading to migration and a shift in traditional fishing grounds, impacting food security and income.

*Ecosystems*

1. The different ecosystems of the five ecological zones in the Niger Delta region (i.e. mangrove forest and coastal vegetation zone, freshwater swamp forest zone, lowland rain forest zone, derived savannah zone and the montane zone) contribute significantly to biodiversity and human well-being. These ecosystems, however, are being impacted by climate change principally through habitat loss (change in temperature and rainfall distribution, SLR and river flooding). The extent of the mangrove forests and threat of SLR on biodiversity is explained in paragraphs34 and 36. Due to the impacts of climate change on the agriculture sector and decreased food security, over-harvesting of certain ecosystems (i.e. lowland and mangrove forests) by communities and industrial actions (i.e. logging) has occurred[[134]](#footnote-134). Furthermore, the impacts of acid rain have detrimentally affected forests and surface water bodies, resulting in a decrease of ecosystem health.

*Livelihoods*

1. The climate change related impacts to all of the above sectors affect the livelihood choices of those living in Delta State. Economic activities are limited and the natural resources upon which local communities are reliant are depleted due to, amongst other factors, the observed changes. People now have to travel long distances in search of fuelwood and forest products (e.g. fruit) used to supplement local diets. Women and children, who are traditionally responsible for fetching fuelwood for the household, are the most affected[[135]](#footnote-135).

***Climate change projections and predicted impacts in Delta State***

1. The future impacts of climate change on development in Delta State, as in the majority of the African continent, will depend on four main factors: i) the extent of the warming; ii) the changes in amount and variability of rainfall; iii) the increase in extreme weather events; and iv) the extent of SLR. By virtue of its location at the coast, Delta State is likely to be severely affected by the impacts of climate change, particularly from SLR.
* *Extent of warming*. The predicted rise in temperature is detailed in paragraph39. The effects of such changes for rural communities are likely to be severe, with reductions agricultural productivity (and hence food security), shortages of drinking water (necessitating longer walking distances for woman and children who tend to fetch water for rural households), spread of diseases such as malaria, reduced potential for hydro-generation of electricity, large-scale migration of people displaced by climate change related events (e.g. floods, lack of food and water) and subsequent civil conflicts and unrest. Other potential effects include the loss of biodiversity, which will reduce the availability of medicinal plants and other forest products (e.g. fruit) and impact negatively on other sectors such as tourism; and a reduction in productivity of some freshwater fisheries (e.g. the Niger River) as a result of increases in water temperature.
* *Changes in rainfall amount and variability.* Although predictions of rainfall changes in Africa are generally less consistent than those for temperature, there are likely to be widespread reductions[[136]](#footnote-136). In the southern region of Nigeria, on the other hand, an increase in rainfall is expected (see paragraphs35and 36). This predicted increase in Delta State will, however, be offset (potentially entirely) by warming and the loss of water via evapotranspiration. Even in the absence of climate change, present population trends and patterns of water use indicate that Delta State, like the whole of Africa, will exceed its limits of ‘economically usable, land-based water resources before 2025’[[137]](#footnote-137). Like in most of sub-Saharan Africa, farmers in Delta State, who are mostly subsistence farmers, are operating with limited resources in fragile environments sensitive to even minor shifts in temperature and rainfall patterns. The livelihoods of rural farmers in Delta State are particularly precarious because of isolation, small farm sizes, lack of secure land tenure, lack of access to technology, lack of access to electricity and fluctuations in global commodity prices and farm inputs.
* *Increase in extreme events*. With its low-lying terrain, high rainfall and many waterways, there is high probability of a greater frequency of floods in Delta State. The impact of such climate change related disasters on the local community will most likely be severe, with widespread famine, disease, epidemics, reduced access to clean drinking water, and large-scale migrations and resulting regional conflicts.
* *Sea level rise.* SLR of any extent will have severe consequences for Delta State, with up 75 % loss of the Niger Delta expected with a 1 m rise in sea level by 2050. The high and low climate change estimates of SLR and predicted loss of land and displacement of communities are detailed in paragraph39. Other impacts include: loss of mangroves and estuaries, which are critical for tourism and fishing industries; loss of Barrier Island Forests, flooding of coastal infrastructure and loss of coastal plantations of crops.
1. These climate change risks are additional to, and are likely to compound, existing socio-economic development challenges. The climatic and environmental problems faced by Delta State are further exacerbated by poverty and limited local economic development as well as the limited adaptive capacity of the local population. Vulnerability is the expression not only of exposure to risk but also of the capacity to manage those risks.

## Past and ongoing activities

1. Under the framework of the Kyoto Protocol, the FGN established[[138]](#footnote-138) the Presidential Implementation Committee on Clean Development Mechanisms (PIC-CDM) in January 2004 and the Special Climate Change Unit (SCCU) in the Federal Ministry of Environment. The PIC-CDM raises awareness among project developers and other stakeholders on the impacts of climate change and the benefits of adopting clean technologies in their projects and processes. Additionally, the PIC-CDM assists in the identification of eligible activities and obtaining of the necessary financing from entities within the Annex I countries seeking carbon credits to meet their emission reduction targets and obligations. The SCCU serves as the national focal point with the responsibility of ensuring that Nigeria meets its obligations to the UNFCCC, as well as to other conventions and protocol activities with other stakeholders, to address the impacts of climate change in Nigeria. The SCCU also guided the constitution of the Inter‐Ministerial Committee on Climate Change[[139]](#footnote-139) (IMCCC).
2. During 2001-2004, the Canada-Nigeria Climate Change Capacity Development Project (C-NCCCDP)[[140]](#footnote-140)conducted several activities to support the FGN in responding to climate change and fulfill its UNFCCC commitments. The C-NCCCDP was funded by the Canadian International Development Agency (CIDA) and coordinated by the Nigerian Environmental Study Action Team (NEST), with technical assistance from the Global Change Strategies International (GCSI) of Canada. The C-NCCCDP worked through three collaborating focal points: i) the Center for Energy Research and Development (CERD) at the Obafemi Awolowo University; ii) the National Climate Change Centre, Federal University of Technology, Minna; and iii) the Rivers State University of Science and Technology, Port Harcourt. The C-NCCCDP supported the delivery of: i) Nigeria's First National Communications to the UNFCCC in 2003 (in collaboration with the Federal Ministry of Environment); ii) a draft national climate change policy, which is currently under discussion at the House of Representatives Committee on Climate Change; iii) the Federal Ministry of Environment’s Climate Change Business Plan; iv) the compilation of a national inventory of sources and sinks of GHG emissions for the period 1994 to 1998; v) proposals for GHG-mitigation (which covered several sectors) and pilot CDM projects; vi) a domestic CDM implementation strategy; and vii) documentation on Nigeria’s climate change vulnerabilities by sectors and sub-sectors and an adaptation plan with project portfolios.
3. Following the achievement of the C-NCCCDP, the Building Nigeria’s Response to Climate Change[[141]](#footnote-141) (BNRCC) project was officially launched in May 2008, to run for a period of 5 years. BNRCC was funded by CIDA and managed by a project management team comprised of a consortium of CUSO and Marbek Resource Consultants, both from Ottawa, Canada. The BNRCC project is being implemented in partnership with NEST. It aims to contribute towards building informed responses to climate change in Nigeria by enhancing capacity at community-, state- and national-levels to implement effective adaptation strategies, policies and actions. The BNRCC project is organised into four components: i) adaptation research; ii) pilot projects; iii) adaptation policy; and iv) communications, outreach and networking. The BNRCC project has activities spread across the country in different states. The research activities will be aimed at: (i) improving understanding of the key drivers of climate variability and climate change; (ii) improving computer models of climate variability and change; (iii) providing an assessment of vulnerability and impacts including social and economic vulnerability; (iv) providing an assessment of the scenarios and framework for adaptation to biophysical impact; (v) providing an assessment of options for adaptation (including gender dimensions); and (vi) developing a national climate change information/data system (NCCIDS). Five pilot projects are underway across the three agro-ecological zones of the country to test local adaptation strategies that include finding alternatives to deforestation, controlling erosion, conserving water, and developing long-term community plans. One BNRCC project is underway in Delta State, involving a research project and a youth programme. The youth programme is an education programme on climate change and waste management involving 25 local government schools.
4. Nigeria had four CDM schemes endorsed in 2009[[142]](#footnote-142) by the UNFCCC, two of which are operational within Delta State, namely: i) the recovery of associated gas that would otherwise be flared at Kwale oil-gas processing plant project; and ii) the Ovade Ogharefe Gas Capture and Processing Project which is an oil field flaring reduction project. The third project, the Lafarge Cement Wapco Plc’s Blended Cement Project at Sagamu Cement and Ewekoro Cement Plants in Ogun State, is also presently operational. The fourth project, Efficient Fuel Wood Stoves for Nigeria, started in 2006 in the Guinea Savannah Zone of Nigeria. In October 2010 a new CDM project was registered, namely the Asuokpu/Umutu Gas Recovery and Marketing Facility. This project involves the recovery of the dry associated gas that is currently flared at the Asuokpu/Umutu Marginal Field and delivery to the Nigerian domestic gas market for productive use as an energy product.
5. In June 2010, the FGN through the Federal Ministry of Environment, embarked on a nationwide campaign on the economic benefits of Climate Change: “The National Carbon Credit Train (TRAIN)[[143]](#footnote-143)”. The ‘TRAIN’ campaign aims to effectively and widely disseminate information on carbon credits and climate change, not only to vulnerable groups but also to local authorities, governments, business people, farmers, and other stakeholders, who will inform the debate and response to Nigeria’s climate change challenge. This campaign was launched in Lagos and will run in all the 36 Nigerian States in the form of a road show and capacity building on Clean Development Mechanism.
6. A number of NGOs and local organisations are also conducting climate change related projects across the country. The Climate Action Network (Nigeria-CAN)[[144]](#footnote-144), a coalition of public and private sectors, civil society organisations, international development organisations and individuals, as well as the Nigerian Youth Climate Coalition (NYCC)[[145]](#footnote-145) are actively involved across the country to create awareness of climate change.
7. 52 projects have received GEF Small Grants for the period 2009 to 2012[[146]](#footnote-146). These GEF projects cover a wide range of climate change activities in sectors of health, adaptation in agriculture and water, climate change awareness, renewable energy, land degradation, and biodiversity. They include three projects in Delta State, namely: i) bioremediation of petroleum contaminated soils in Emede[[147]](#footnote-147) (operational phase July 2009 – June 2010); ii) Isoko afforestation project[[148]](#footnote-148), Oleh, Isoko South LGA Delta State (operational phase July 2009 – June 2010); and iii) erosion and flood control with Vetiver grass in three local government areas[[149]](#footnote-149) (operational phase July 2009 – June 2010).
8. Under the partnership for Clean Indoor Air and Delta State, the Nigerian GAIA[[150]](#footnote-150) project was launched in February 2007. It is a pilot research project, testing methanol-fueled CleanCook stoves in 150 randomly selected homes from the three senatorial districts of Delta State. The project was conducted by the Centre for Household Energy and Environment, the Stokes Consulting Group and Domestic, with grants from the United States Environmental Protection Agency (USEPA), and support from Delta State’s Ministry of Power and Energy. The pilot study results showed that households in Delta State strongly prefer the CleanCook to kerosene stoves. The GAIA project is currently with the NEPAD Pan‐Africa Cassava Initiative to create a market for ethanol from cassava, and to make 6000 CleanCook stoves available to households in Delta State.
9. A UN-REDD+ readiness process has been initiated at the national level, as well in the Cross River State[[151]](#footnote-151). The Cross River State is of particular importance as it contains half of Nigeria’s remaining forests[[152]](#footnote-152),[[153]](#footnote-153). The UN-REDD Programme coordinated by the UNDP, the United Nations Environment Programme (UNEP) and the Food and Agriculture Organisation of the United Nations (FAO). A scoping team has surveyed designated pilot sites within the Cross River State, and two stakeholder workshops have been held. A National REDD+ Plan is anticipated to be completed before the end of 2010, and endorsement by the UN-REDD Council is expected in March 2011[[154]](#footnote-154).
10. Cumulative Impacts Assessment (Professor Steiner, University of Alaska, USA). This project is about to be initiated within Delta State (See Annex 6), and will involve i) an assessment of oil damage over the decade time scale; ii)in investigation into feasible options for large scale restoration of damaged areas; and iii) the development of protocols to effectively prevent future oil spill impacts.
11. Under its Climate Change Adaptation Programme[[155]](#footnote-155), The UK’s Department for International Development (DFID) financed a five year project in 2006 in 25 African countries including Nigeria. The project, entitled the Climate Change Adaptation in Africa (CCAA) programme, was led by the International Development Research Centre (IDRC). The CCAA developed four objectives to improve the capacity of African countries to adapt to climate change, namely through; (i) strengthening the capacity of African scientists, organizations, and decision makers; (ii) supporting adaptation by rural and urban people through action research; (iii) generating a better shared understanding of findings on climate change; and (iv) informing policy processes with good quality science-based knowledge. Two projects were conducted in Nigeria as part of the CCAA programme. The project entitled ‘strengthening the capacity of smallholder farmers to adapt to climate change’ project started in 2007. This project supported the production and testing of a 26-episode radio drama featuring climate adaptation content, targeted at smallholder farmers, especially women. The episodes were produced locally in two local languages and broadcast weekly by five radio stations over a period of six months. The second project, the Rural Urban Interaction to cope with Climate Change (RUICC) project, started in 2009 and aims to reduce the vulnerability of rural-urban systems in Nigeria to climate change by sharing the results generated from a pilot project conducted in and around the city of Aba, South Eastern Nigeria.

*Relevant UNDP activities*:

1. Given the potential implications of climate change on Nigeria’s development, the UNDP Country Office considers climate change a top priority issue and is engaging closely with the Government on various fronts. The strategy is to pursue climate change mitigation and adaptation in the context of an environmentally sound and sustainable socio-economic development framework. UNDP Nigeria aims to support the country’s efforts to scale up climate change mitigation and adaptation activities to enable the country to embark upon a low emission, high growth, climate resilient, socially equitable, gender sensitive and sustainable path[[156]](#footnote-156).
2. While all sectors of the national economy will be affected by climate change, UNDP Nigeria focuses specifically on sectors that would have some comparative advantage in supporting national aims*[[157]](#footnote-157)*, namely: i) capacity development and advocacy for mitigation and adaptation; and ii) supporting development of new climate related policy. These two overarching interventions will support broad mitigation and adaptation actions, which include: i) promoting energy efficiency in the economy; ii) promoting renewable energy; iii) improving public energy access; iv) reducing carbon and GHG emissions as well as wastes; and v) promoting sustainable use and conservation of ecosystems and biodiversity.
3. UNDP’s climate change strategy suggests that the current development assistance dealing with climate change must be complemented by an ambitious integrated planning framework. This framework will focus on economic development and the transformation of regions in the face of climate change, and will support the implementation of national policies at the regional level. The integrated planning framework will: i) articulate both short and medium-to-long term regional development priorities; ii) assist in aligning development assistance with the identified regional development priorities; iii) identify potential trade-offs between interventions in different sectors; and iv) address mitigation and adaptation activities in an integrated manner in the development context; and v) identifying priority actions with multiple benefits (i.e. those with mitigation, adaptation and/or development dividends).
4. The UNDP is currently engaged in implementing the Africa Adaptation Programme *(*AAP), a key project focused on adaptation and mitigation in Nigeria. The AAP is funded by the Government of Japan and convened by UNDP. The AAP aims to provide an umbrella programme for all other climate change adaptation projects. The programme funds African countries to create a strategic enabling environment for climate change adaptation (CCA) and disaster risk reduction (DRR). One of the key aims of this programme is to improve coordination of adaptation activities (which are currently implemented on an *ad hoc* basis). Nigeria is one of the 20 countries selected to participate in this programme.
5. The UNDP Niger Delta Project[[158]](#footnote-158) has been developed in order to mainstream biodiversity conservation issues into the oil and gas sector within the Niger Delta, particularly into their development policies and operations. The Niger Delta is a biodiversity hotspot[[159]](#footnote-159) under significant environmental threat[[160]](#footnote-160) from *inter alia* population growth, the oil and gas industry (see paragraph 13 and 17), and overharvesting. The project has three components, namely: i) implementing a governance framework to reduce threats and risks to priority ecosystems and to mainstream biodiversity conservation in the Niger Delta oil and gas industry; ii) facilitating engagement between the oil and gas industry communities on topics related to managing biodiversity areas in the Niger Delta; and iii) developing financial mechanisms for the oil and gas industry to support biodiversity conservation and community based management activities. The project’s executing partners include the Federal Ministry of Environment (MoE) in collaboration with the Niger Delta Development Commission (NDDC), and the Federal Ministry of Niger Delta Affairs (MNDA). Additionally, the project will be receiving support from the NGO Bioresources Development and Conservation Programme (BDCP). The project’s total budget is US$ 9.8 million, including co- financing.
6. Linkages will be established between the TACC programme and other relevant projects in Delta State during the inception phase.

## Barrier Analysis

1. Effective climate change GHG mitigation and adaptation will require long-term planning and explicit consideration of climate change risks across sectors. Given the complex, cross-cutting nature of climate change and the scale of the challenge, a comprehensive strategy for implementing a dynamic, long-term and coherent approach to GHG mitigation and adaptation needs to be adopted. Such a strategy requires committed leadership, strong institutions, and a comprehensive and multi-disciplinary approach. Furthermore, to achieve the kind of transformational change that is required, climate change risks and opportunities need to be routinely considered as part of poverty reduction and sectoral strategies, policies and measures. Without such consideration, the management of climate change risks and opportunities is unlikely to be catalytic, strategic or cognisant of the numerous links across sectors and administrative levels.
2. A key aspect of the TACC programme will be to assist Delta State to reduce the maladaptive costs that result from duplicative, *ad hoc*, delayed and under-sized adaptation efforts, and to catalyse the raising of additional finance in a timely and predictable manner to meet the full costs of adaptation.
3. Due to the complexity and inter-sectoral nature of climate change impacts, the TACC programme will not be able to tackle all of the problems related to climate change. However, it will rather lay the foundation for the systematic addressing of risks within all sectors within Delta State over time, and will for now focus on a few key areas that can catalyse rapid mobilisation of financing and or quick-win priority interventions. For this reason, the programme will focus its efforts on addressing three key themes identified through widespread consultation with numerous stakeholders during the international consultant’s mission to Delta State during September 2010 (See Annex 6). These three key themes are presented below in the barrier analysis:

***Understanding of the current biophysical environment and the future environment under climate change is minimal and poses a significant barrier to evidence-based planning and decision-making.***

1. Within Nigeria, and particularly within Delta State, there is a lack of information and capacity to integrate climate change considerations (both adaptation- and GHG mitigation-related) into decision-making[[161]](#footnote-161). Of immediate concern is the limited understanding of the current biophysical environment, which influences how the state responds to climate change including *inter alia:* i) an increase in temperature; ii) SLR; and iii) an increase in extreme weather events including floods and droughts (see paragraph48). In terms of understanding the biophysical environment, for example, little is known about the impact that decades of oil spills have had on the environment within Delta State, which have reduced the resilience of the natural environment to withstand anticipated climate change impacts whilst also reducing the GHG mitigation capacity of the mangrove forest. Coupled with this is the insufficient knowledge available on the dynamics of the Niger Delta itself, in terms of appropriate management of drainage lines, flood lines and water-logged areas. This also serves to reduce the efficacy of the Niger Delta as a natural buffering system to anticipated climate change impacts, such as increased storm activity. Additionally, the water sector is currently constrained by a lack of baseline information to guide appropriate policy decisions[[162]](#footnote-162), and consequently, there is a high risk that current development planning is not following principles of sustainability or taking climate change threats into consideration. Overall, the risk this limited understanding poses to present development planning will increase further as climate change impacts amplify underlying environmental challenges.
2. The TACC programme will contribute to overcoming this barrier within Delta State by improving knowledge within the public and private sector pertaining to the current state of the biophysical environment as well as the nexus between environmental degradation and climate change impacts. In so doing, the TACC programme will build capacity within Delta State to restore degraded ecosystems and thereby improve resilience to anticipated climate change impacts.

***Development planning and policies in Delta State do not take climate change into consideration and many policies are inadequate and poorly implemented.***

1. There is minimal land use planning presently underway in Delta State, particularly for water management, development and industry. For example, it is not known where natural drainage lines are located, and consequently where infrastructure development[[163]](#footnote-163) would be most appropriate. There is also no state water policy and consequently very little control over water management exists. As a result, boreholes are currently installed on an *ad hoc* basis and without prior planning[[164]](#footnote-164). This situation could lead to future water stress, particularly under climate change related changes in rainfall and SLR. Furthermore, there is often very little enforcement of policies, planning and regulations within Delta State[[165]](#footnote-165), such as the case with reducing gas flaring by the industrial petroleum private sector. There is also a lack of maintenance of infrastructure, particularly in the water and oil sectors[[166]](#footnote-166), which is often the cause behind oil spills. Currently, limited guidelines or plans exist regarding oil spill cleanups and appropriate ecosystem restoration protocols to be followed after destructive industrial activities have taken place and where they do exist they are seldom monitored effectively. As a result of the abovementioned challenges, the environmental integrity of the Niger Delta is compromised, which significantly reduces the potential of the Niger Delta to act as a natural buffering system to anticipated climate change impacts (see paragraph 25).
2. Delta State Ministry of Environment has produced a Delta State Government Climate Change Programme 2010, which was unofficially presented at COP 15 in Copenhagen in 2009. This document establishes a foundation on which the ITCP can build upon, and can assist in mainstreaming climate change considerations across sectors. However, climate change considerations are not yet fully integrated into development planning and policies within Delta State (such as the Delta Region Master Plan[[167]](#footnote-167)). Development planning within the Economic Planning Ministry, for example, does not presently take into consideration anticipated climate change[[168]](#footnote-168). As the Economic Planning Ministry is tasked with macro-economic analysis and prioritisation of Delta State development planning, it is critical that the ministry is highly informed on both climate change GHG mitigation and adaptation, and that planning takes into consideration anticipated climate change. As a result, the policy environment does not enable effective GHG mitigation and adaptation within Delta State at present despite considerable interest in implementing adaptation and mitigation measures in order to contribute towards reversing the considerable environmental degradation within the state. As such, Delta State government has not been able to encourage investors to provide seed money for the testing of proof of concepts for future GHG mitigation- and adaptation-related projects[[169]](#footnote-169).
3. Furthermore, policies, norms, regulations and laws regarding urban planning and infrastructural development are inadequately enforced by Federal agencies in charge of the environment and there is little adherence to industrial standards. Additionally, the installation of facilities and utilities in ecologically sensitive zones is undertaken without appropriate planning and without adherence to existing regulations, which will further exacerbate the effect of climate change impacts[[170]](#footnote-170).
4. The TACC programme will address this barrier by creating an enabling environment for effective adoption of GHG mitigation and adaptation activities. This will be achieved through revising relevant policies and legislation to incorporate climate change considerations. Additionally, the TACC programme will facilitate the development of a Climate Change Strategy and Integrated Territorial Plan (ITCP) for guiding future GHG mitigation and adaptation investments in the public and private sector of Delta State.

Institutional and individual capacity to adapt to climate change and utilise GHG mitigation opportunities in the key sectors within Delta State are currently under-developed. This is particularly evident in the limited capacity to identify appropriate adaptation and mitigation measures.

1. Although Nigeria has a comparatively highly educated population in comparison to other developing countries, individuals and institutions are limited in terms of GHG mitigation and adaptation capacity[[171]](#footnote-171). Even in a baseline scenario without climate change, sectors such as water[[172]](#footnote-172) and forestry have identified a need and willingness for capacity building and training. For example, there is a need for capacity building of foresters in order to improve documentation and recording of forest cover (i.e. to determine actual deforestation rates in order to highlight the need for reforestation and restoration activities)[[173]](#footnote-173). There is also a need to build the capacity of politicians and decision-makers on topics such as deforestation within the forestry sector.
2. To date, Nigeria has not benefited from either the Clean Development Mechanism (CDM) or the voluntary carbon market (e.g. through standards such as the Voluntary Carbon Standard (VCS)), and has only registered five CDM projects, one of which is in Delta State[[174]](#footnote-174). This is because of a major shortage in capacity to undertake the necessary work required to produce Project Idea Notes (PINs) and full Project Design Documents (PDDs). As a result, there is a lack of capacity to facilitate the design of bankable project documents that will be accepted by both investors and the carbon markets[[175]](#footnote-175), including projects related to carbon accounting[[176]](#footnote-176). Where projects do exist, they tend to be related only to the reducing the emissions of the oil industry, rather than on capitalising on opportunities, which could be funded through carbon markets, to restore degraded ecosystems within Nigeria, and indeed Delta State. The only project of this kind to date is the Reducing Emissions through Deforestation and Forest Degradation (REDD+) project presently underway in the Cross River State (see paragraph 69). Generally, there is very little capacity for REDD+ and carbon accounting in Nigeria (i.e. CDM, VCS AFOLU)[[177]](#footnote-177). Carbon accounting and REDD+ projects are of particular relevance for Delta State considering the current levels of ecosystem degradation.
3. In addition to improving capacity to increase access to the CDM and voluntary carbon market, there is also a need to build capacity in the technical and industrial sectors in order to utilise available GHG mitigation opportunities. For example, there is a lack of capacity for adopting and piloting new technologies for potential bankable projects related to GHG mitigation and adaptation, such as reverse osmosis which is a potential adaptation measure[[178]](#footnote-178).
4. General climate change awareness and an understanding of the linkages between everyday actions and the environment are poorly understood among the general public in Delta State[[179]](#footnote-179). This is particularly so for rural communities, who are likely to be the worst affected by anticipated climate change as a result of their underlying vulnerabilities (e.g. poverty, food insecurity and limited financial capacity). This awareness and understanding needs to be improved within Delta State in order to increase adaptive capacity reduce vulnerability to anticipated climate change impacts and curtail environmental degradation. The TACC programme will address this barrier within Delta State by firstly demonstrating effective GHG mitigation and adaptation technologies at the local level through the piloting of small-scale interventions and secondly through directly raising the awareness of local authorities and communities of suitable GHG mitigation and adaptation technologies based on the results of the interventions piloted.

# B. Project Strategy

**Programme objective, outputs and activities**

1. The overall objective of the TACC programme is to reduce the vulnerability of local communities within Delta State to anticipated climate change impacts, through the promotion of low-carbon and climate-resilient local development (LECRD). Environmental degradation within Delta State has reduced the coping capacity of local communities to anticipated climate change impacts by reducing the supply of a wide range of ecosystem goods and services, decreasing agricultural productivity and undermining fresh water supply. Further to this, it has compromised the efficacy of natural buffer systems provided by intact ecosystems, such as mangroves, to withstand climate change impacts related to SLR and storm surges (see paragraph25). Understanding this nexus between climate change impacts and environmental degradation is of fundamental importance for addressing climate change challenges in Delta State. The TACC programme will develop this understanding through in depth assessments of the biophysical and socio-economic factors involved. In so doing, technical capacity for assessing climate change risks will be developed across a wide range of sectors in Delta State. Capacity will also be developed to enable local decision-makers and planners to design policies and strategies that take climate change risks into account, and that promote investments in appropriate mitigation and adaptation interventions, particularly ecosystem-based approaches. Ecosystem-based approaches to adaptation can greatly reduce the vulnerability of local communities to climate change by increasing supply of ecosystem goods and services, such as fruit, fish, meat, fiber, and water. Importantly, the TACC programme will facilitate the development of an Integrated Territorial Climate Plan (ITCP) for Delta State which will lay the foundation for a new LECRD pathway that takes climate change risks into explicit consideration[[180]](#footnote-180). The barriers to initiating this development pathway (identified in the Barrier Analysis Section above) will be specifically addressed through the programme outputs in this section.
2. The TACC programme will undertake biophysical and socio-economic assessments as well as cost-benefit analyses to assess the suitability of potential GHG mitigation and adaptation interventions. In so doing, understanding of the biophysical and socio-economic factors will be developed and opportunities and constraints to effective GHG mitigation and adaptation will be identified. As a result, a strategy for the implementation of priority interventions will be developed. Additionally, the TACC programme will facilitate the creation of an enabling policy environment for the implementation of priority interventions, which will encourage upscaling. Lessons learned and information generated through the implementation of priority interventions will be disseminated back into the socio-economic and biophysical assessments in order to inform interventions identified and selected in the future. This should be a continuous process that fosters a culture of adaptive management. Learning organisations will be created and strategies will be adjusted as understanding is improved. This conceptual model for the TACC programme is set out in Figure 4 below.

**Biophysical and socio-economic situation assessed**

**Opportunities and constraints identified**

**Strategy developed**

**Mainstreaming undertaken**

**Implementation undertaken**

**Lessons learned disseminated**

**Figure 4**. Diagrammatic representative of the TACC programme’s strategy.

**Output 1**: Biophysical and socio-economic assessment of the nexus of environmental degradation and climate change undertaken.

*Establishing technical working groups*

1. Understanding of the current biophysical environment and of the likely impacts climate change will have on natural ecosystems is limited within Delta State. This lack of information hinders the identification and implementation of appropriate GHG mitigation and adaptation technologies. The TACC programme will consequently establish multi-stakeholder technical working groups and build capacity within the public and private sector for undertaking the necessary biophysical and socio-economic assessments. Technical working groups will be established to focus on key climate change-related topics (covering both GHG mitigation and adaptation) within relevant sectors, including: i) health; ii) water; iii) energy; iv) agriculture; v) forestry; vi) fisheries; and vii) tourism (see paragraphs 41-46). These technical working groups will comprise stakeholders from Delta State ministries, local authorities, academic institutions, NGOs and the private sector. The technical working groups will act as a mechanism to empower local authorities and foster multi-stakeholder governance as well as to promote policy dialogue related to climate change and necessary GHG mitigation and adaptation interventions to be undertaken by local authorities. Pivotal to the role of the technical working groups will be their contribution to: i) the development of a climate profile for Delta State (see Annex 4), which will include information related to risks and opportunities related to the implementing of GHG mitigation and adaptation technologies; ii) the development of low-carbon and climate-resilient development strategies; iii) the identification of capacity deficits, i.e. where capacity building is required; and iv) the development of bankable project ideas and feasibility studies. The technical working groups will be established to work under the CCCU.

*Building capacity*

1. Additionally, the TACC programme will build capacity within public and private sectors for undertaking quantitative environmental and climate change impact assessments, including (but not limited to): i) an assessment regarding ecosystem resilience to anticipated climate change impacts (importantly, linkages will be established with the cumulative impacts assessment to be undertaken in Delta State (see paragraph70); and ii) a hydrological and topographical survey of Delta State to catalyse effective land use planning (i.e. to climate-proof future development by reducing risks posed by climate change, such as increased flooding). Land use planning is critical within Delta State (particularly because of its proximity to the coast and extensive waterways) in order to climate-proof future development and prevent *ad hoc* development from increasing the vulnerability of communities, infrastructure and natural ecosystems to anticipated climate change impacts. Specifically, a land use plan is required that will identify areas: i) where development is appropriate; ii) that require soft engineering/ecological solutions; and iii) where development is not advised (i.e. areas that, if developed, will reduce the resilience of communities and natural ecosystems within Delta State to withstand climate change impacts).

*Undertaking cross-sectoral studies related to the nexus between environmental degradation and climate change impacts*

1. Importantly, to improve knowledge related to the nexus between environmental degradation and climate change impacts, the TACC programme will facilitate the undertaking of cross-sectoral studies on the inherent linkages between both topics. Through this exercise, the TACC programme will identify and map the regions and communities within Delta State which are most vulnerable to anticipated climate change impacts. It is anticipated that climate change vulnerability and levels of environmental degradation will be strongly correlated. Finally, to improve knowledge related to total GHG emissions from anthropogenic activities underway within Delta State, the TACC programme will develop Terms of Reference (TOR) for specialists to be hired to: i) quantify GHG emissions by sector in order to identify present GHG mitigation opportunities; and ii) forecast the energy needs of Delta State and thus the likely future GHG emissions in order to identify future GHG mitigation opportunities. At present, programme funds are insufficient to finance quantification of GHG emissions by sector. The development of TORs will provide platform for the raising of funds to undertake the necessary work.
2. Activities and sub-activities under this output will include:
3. Establish technical working groups on key sectors under Delta State Climate Change Coordination Unit (CCCU).
	* Build capacity of the newly formulated Delta State CCCU and the technical working groups.
	* Develop and facilitate the signing of Memorandums of Understanding (MOUs) between key Delta State ministries to provide human resources to form part of the CCCU and technical working groups.
	* Build capacity within the public and private sector (including technicians) for undertaking quantitative environmental and climate change impact assessments.
	* Establish linkages for cross-learning with other large GHG mitigation and adaptation projects in Nigeria and other Nigerian states e.g. the proposed UNDP Niger Delta Conservation Project (see paragraph 76) and the REDD+ project in Cross River State (see paragraph 69).
	* Collate information collected by technical working groups and develop a climate profile for Delta State (see Annex 4).
4. Conduct in-depth, cross-sectoral studies on the nexus between environmental degradation and climate change impacts in Delta State.
	* Identify the most vulnerable regions and communities within Delta State, and present results in Geographic Information Systems (GIS) map-based formats.
	* Utilise the results of the studies to identify priority GHG mitigation and adaptation interventions (Output 3).
	* Collate and include information from the studies in the climate profile (developed in Activity 1.1) for Delta State.
5. Establish linkages with the UNDP Niger Delta Project (see Past and Ongoing Activities Section).
6. Develop the TORs for the quantification of present and future GHG emissions by sector in Delta State.

**Output 2**: Plans for GHG mitigation and adaptation interventions developed in Delta State, in both the public and private sector.

1. Activities within this output will focus on firstly identifying potentially appropriate GHG mitigation and adaptation interventions, secondly building capacity to implement identified interventions and thirdly improving access to key funding mechanisms to ensure their implementation.

*Identifying interventions*

1. The TACC programme will identify a comprehensive list of GHG mitigation and adaptation interventions across relevant sectors (e.g. health, water, energy, agriculture, forestry and fisheries). The identification of interventions will, importantly, be based on the studies undertaken within Output 1 related to the nexus between environmental degradation and climate change impacts in Delta State as well as desktop studies. Table 1 presents a starting point for the development of the comprehensive list. The interventions identified will then be prioritised according to their: i) potential as quick-win interventions; ii) cost-effectiveness and internal rate of return; iii) ability to catalyse funding; iv) contribution to the livelihoods of vulnerable communities; v) ability to reflect progress/success over a relatively short time period (i.e. within the duration of the TACC programme); vi) potential for upscaling to other states within the Niger Delta; and vii) probability of adoption by vulnerable communities. Additionally, based largely on the information developed through Output 1’s activities and the GHG Mitigation Options Assessment for Nigeria (2000 – 2040)[[181]](#footnote-181), the TACC programme will assess both opportunities and constraints for each of the identified GHG mitigation and adaptation interventions. Constraints hindering the implementation of identified interventions are likely to include, for example: a limited or undeveloped market, weak policy and regulatory environment, insufficient and poorly implemented technology standards/codes. As a result of the above assessments and analyses, the project will prioritise interventions within the comprehensive list.
2. Additionally, the TACC programme will conduct feasibility studies on five of the prioritised interventions and develop TORs to conduct feasibility criteria on a further five prioritised interventions. Annex 3 includes interventions, highlighted by stakeholders as being necessary during meetings with the IC (see Annex 6), and is the first step in the development of the TORs. Results of this output will be included within the Climate Change Strategy of the ITCP (see Annex 4), and assist in guiding future adaptation- and GHG mitigation-mitigation related investment decisions.

**Table 1.** A list of potential GHG mitigation and adaptation interventions applicable to Delta State, on which the comprehensive list developed through the TACC programme can be built.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Health** | **Water** | **Energy** | **Agriculture** | **Forestry** | **Fisheries** |
| Building of programmes to build ventilated pit latrines (see Annex 3, section 4.1); | Develop and upscale rainwater harvesting technologies (see Annex 3, section 2.1); | Develop methane harvesting projects from landfills (see Annex 3, section 5.1); | Develop and implement effective land use planning and zoning (see Annex 3, section 1.1); | Promote conservation through cultivation for non-timber forest products; and promote private forests estates through establishment of central nursery for the production and distribution of fast-growing tree species (See Annex 3, section 1.4); | Maintain wetlands and restore mangroves in order to contain pollutionand thereby improve the productivity of fisheries; (see Annex 3, section 3.1); |
| Distribution of mosquito nets (see Annex 3, section 4.2); | Develop and upscale “air to water” projects (see Annex 3, section 2.2); | Roll out CFC light bulb instalment programme, aimed at government buildings and invest in solar energy to power street lights (see Annex 3, section 5.2); | Promote alternatives to the practice of slash and burn farming (see Annex 3, section 1.2); | Undertake forest restoration projects: within lowland tropical forest and degraded coastal forest to reduce the impacts of flooding (see Annex 3, section 3.2); |  |
| Intensification of vaccination programmes (see Annex 3, section 4.3); | Build on/invest in solar water pumps in order to reduce the use of generators (see Annex 3, section2.3); | Utilise gas emitted from the oil industry (as an alternative to flaring) (see Annex 3, section 5.3); | Develop and promote appropriate agricultural research (see Annex 3, section 1.3); |  |  |
|  | Promote and develop watershed protection projects (see Annex 3, section 2.5); | Develop alternative energy sources (e.g. biogas, solar) and introduce fuel-efficient stoves in rural communities (see Annex 3, section 5.4); | Develop and promote storage and processing technologies to reduce post-harvest food loss (see Annex 3, section 1.5); |  |  |
|  |  | Develop green building codes and energy demand side management (see Annex 3, section 5.5); |  |  |  |

*Building capacity to develop business plans and access funding*

1. Based on the feasibility studies conducted, the TACC programme will develop bankable business plans for three of the prioritised interventions, which will include details regarding their potential returns and key barriers to their implementation. Additionally, the TACC programme will build capacity within local authorities for the development of additional bankable business plans for the other prioritised interventions. This will involve training on business plan development.
2. Additionally, a capacity assessment of local authorities will be conducted for the implementation of the prioritised interventions for which the TACC programme has developed business plans. Based on the capacity assessment, the TACC programme will address identified capacity deficits (e.g. through the provision of training in financial planning, project management, environmental governance and fund-raising) where necessary.
3. The TACC programme will also identify innovative funding mechanisms (e.g. through the CDM, voluntary carbon markets, Ecological Fund of Nigeria[[182]](#footnote-182) and the Adaptation Fund, see Annex 5 on potential funding mechanisms) for the priority interventions (particularly those for which business plans have been developed). In order to facilitate access to the identified funding mechanisms, the TACC programme will improve the capacity of the public and private sector through, for example, conducting training in funding proposal writing as well as in PDD design and development. Innovative funding mechanisms are emerging frequently in the international funding arena (e.g. new carbon markets) and consequently the training provided by the TACC programme will be conducted at least twice per annum. In so doing, the TACC programme will facilitate ongoing up-skilling and allow for local authorities within Delta State to keep abreast of opportunities emerging internationally. Importantly, this will include creating the appropriate institutional framework (i.e. through the CCCU)to support these interventions.

*Revising policy*

1. The TACC programme will also facilitate the creation of an enabling policy environment to encourage additional investment in and adoption of GHG mitigation and adaptation interventions. This will include proposing policy revisions, such as the incorporation of climate change considerations into development planning and policy within Delta State.

*Developing the ITCP*

1. The ITCP will include both a Climate Change Strategy and an Action Plan (see Annex 4 for more details), which will be developed through extensive consultations and partnership building in order to generate ownership of the plan. As a result, the ITCP will represent a road map guiding future climate change-related activities (including both GHG mitigation and adaptation interventions), economic and development planning and interventions within Delta State. A key objective of the ITCP is to assist decision-makers within Delta State to identify priority GHG mitigation and adaptation interventions in highly vulnerable sectors in order to reduce adaptation costs into the future. The ITCP will be externally reviewed and approved. Importantly, the development of the ITCP for Delta State should seek linkages with the development of Nigeria’s National Adaptation Strategy and Plan of Action (NASPA[[183]](#footnote-183)), which is currently underway, in order to promote synergies and avoid duplication of efforts. The NASPA aims to identify priority interventions to respond to Nigeria’s urgent and immediate needs with regard to adaptation to climate change.
2. Activities and sub-activities under this output will include:
3. Develop a comprehensive list of potential GHG mitigation and adaptation interventions for Delta State.
4. Prioritise GHG mitigation and adaptation interventions within the comprehensive list developed in Activity 2.1.
	* Undertake cost-benefit analyses and calculate which IRRs will provide information related to the likely costs and potential returns of proposed interventions (working closely with the Economic Planning Ministry).
	* Assess opportunities and constraints for the GHG mitigation and adaptation interventions based on: i) information produced in Output 1; and ii) the GHG Mitigation Options Assessment for Nigeria (2000 – 2040).
5. Conduct feasibility studies on five of the prioritised interventions.
6. Develop TORs for feasibility studies for an additional five of the prioritised interventions.
7. Develop bankable business plans for three of the interventions for which feasibility studies were conducted.
8. Identify and consult stakeholders within government, private sector, NGO sector and civil society on the priority interventions.
9. Assess the capacity of different sectors to implement the priority interventions.
10. Build capacity for the implementation of GHG mitigation and adaptation interventions where appropriate[[184]](#footnote-184).
	* Conduct training on the development of business plans for priority interventions.
11. Identify innovative funding mechanisms for the priority interventions.
	* Build capacity of the public and private sector to access the innovative funding mechanisms (e.g. training in funding proposal writing as well as in PDD design and development). This will also involve linking with the TRAIN campaign (see Past and Ongoing Activities Section)
	* Advise Delta State decision-makers on the most appropriate funding mechanisms for undertaking the identified high priority interventions.
12. Create an enabling policy and institutional environment for GHG mitigation and adaptation interventions.
	* Review existing policies, legislation and institutional arrangements pertinent to large-scale cross-sectoral interventions[[185]](#footnote-185).
	* Propose revisions to policy and legislation that will catalyse GHG mitigation and adaptation interventions.
	* Assess and develop structures for the flow of funds in REDD+ projects, and other GHG mitigation projects i.e. determine ownership of CERs and how funds will flow to community beneficiaries.
13. Develop a set of scientifically-based guidelines, protocols and best practices for environmental management (including oil spill clean ups) and restoration projects. This activity will be linked to the cumulative impacts assessment to be undertaken within Delta State (see paragraph70).
14. Based on activities above, develop a Climate Change Strategy and Integrated Territorial Climate Plan (ITCP) for guiding bankable GHG mitigation and adaptation interventions in the public and private sector of Delta State.
15. Mainstream the ITCP principles into key sectors[[186]](#footnote-186) in DeltaState (including the three districts: Delta North, Delta South and Delta Central) and into national planning, policy-making and decision-making (see Output 4).

**Output 3**: GHG mitigation and adaptation interventions piloted in communities most vulnerable to climate change impacts.

*Implementing quick-win interventions*

1. In order to build the confidence of local partners and demonstrate the potential for the TACC approach, the TACC programme will pilot quick-win small-scale GHG mitigation and adaptation interventions in communities identified to be the most vulnerable to anticipated climate change impacts. The selection of communities will be based on the mapping exercise undertaken in Output 1. The following three quick-win interventions have been selected for implementation: i) mangrove restoration and post oil spill rehabilitation (demonstrating best practice); ii) fuel-efficient stoves installation; and iii) solar installations for health and water purposes. *These three interventions will be further validated during the inception phase.*

*Establishing public private partnerships*

1. Public private partnerships (PPP) and synergies with ongoing projects (see paragraph 61 - 71) will be sought in order to build on these proposed interventions, and to potentially identify further funding or partnerships. Such an approach will benefit both the communities involved and could assist in reducing the carbon footprint of private sector entities that become involved.

*Priority interventions*

1. ***Mangrove restoration and post oil spill rehabilitation (demonstrating best practice)***

Given the current deforestation and degradation of mangroves in Delta State, due to demand for fuelwood, as well as oil spill degradation (see paragraph 25), there is an urgent need for demonstration and upscaling of mangrove restoration as well as to develop best practices in restoration and rehabilitation. This pilot intervention will aim to develop such best practices through small-scale trials of restoration techniques.

1. ***Fuel-efficient stoves installation for communities***

Given the current need for energy, particularly, in rural economies, and the current rates of deforestation and forest degradation (see paragraph 13) the installation of fuel-efficient stoves will serve as an appropriate GHG mitigation and adaptation intervention. There is currently a drive to implement such technologies in Nigeria. However, this requires upscaling and further proof of concept in order to attract further funding for such initiatives. This project will aim to demonstrate the efficacy of such an alternative energy source. Lessons will be drawn from the Nigerian GAIA project (see Past and Ongoing Activities Section) which introduced CleanCook stoves to Nigeria.

1. ***Solar installation for health and water***

The need for energy, particularly clean sources of energy, in a number of sectors within Delta State (particularly health and water) is immense. The health sector, for example, has limited access to solar powered transportable fridges for the transport of vaccines and samples[[187]](#footnote-187). As disease trends are predicted to increase as a result of climate change, an improvement in the roll out of vaccinations is an important adaptation response. Additionally, the water sector is currently utilising generators for water pumping and there is a need to replace these with solar pumps to reduce significant amounts of noise and air pollution that they create[[188]](#footnote-188). This intervention is also a GHG mitigation response, as utilisation of solar energy reduces GHG emissions.

1. Activities for each of the quick-win interventions will include:
2. Identify potential partner projects and public private partnerships in order to determine the scope for additional funding for this intervention and/or to bolt this intervention onto an ongoing activity.
3. Identify demonstration site(s) following a transparent and participatory process. Communities should be nominated, for example, to avoid potential inter-community conflict. This should also be based on the mapping exercise undertaken through Output 1.
4. Implement the intervention based on consultation with local authorities and communities.
5. Establish a monitoring system for implemented actions to determine their relative success and cost-effectiveness. Where possible, this should be undertaken by local NGOs.

**Output 4**: Best practices for development of GHG mitigation and adaptation interventions disseminated to national government and to local authorities in other states within the Niger Delta.

*Increasing climate change awareness*

1. Presently, general awareness regarding climate change and appropriate GHG mitigation and adaptation options is limited within local authorities and communities within Delta State, and indeed neighbouring states. In order to improve this situation, it is critical to disseminate the lessons and information generated through the TACC programme across Delta State and its neighbouring states. This is because the states within the Niger Delta are highly vulnerable to anticipated climate change impacts, largely as a result of the fact that they are low-lying and criss-crossed with waterways (see paragraph 47). Additionally, the dissemination of lessons learned will develop adaptive capacity and the potential for upscaling of priority actions.

*Disseminating best practices and lessons learned*

1. To achieve this, lessons learned through the implementation of the small-scale GHG mitigation and adaptation actions will be disseminated to numerous stakeholders using a variety of means (e.g. parliamentarian working groups, radio broadcasts, policy briefs and workshops). The TACC programme will also disseminate best practices and lessons learned to a national scale through linkages with the Africa Adaptation Programme, which has a large knowledge management component. Field trips for local authorities within neighbouring states will be organised in order to demonstrate the effectiveness of successful actions implemented by the TACC programme. Importantly, lessons learned will be disseminated in local vernacular in order to target all stakeholders. Additionally, local knowledge regarding climate change (including both GHG mitigation and adaptation) will be increased through the introduction of modules for school and university curricula regarding GHG mitigation and adaptation actions within Delta State and their relevance. Importantly, the nexus between environmental degradation and vulnerability to climate change will be highlighted in the proposed curricula in order to generate community awareness of the need for GHG mitigation and adaptation interventions. Awareness raising activities will also include information regarding CDM, VCS AFOLU and REDD+ funding mechanisms. By facilitating the transfer of GHG mitigation and adaptation-related knowledge, the TACC programme will inform economic and development planning, including budgetary decisions, within Delta State.
2. Activities under this output will include:
3. Present the TACC programme results to parliamentarian working groups.
4. Develop modules for school and university curricula on GHG mitigation and adaptation options for Delta States (establish linkages and learn lessons from the BNRCC youth programme within Delta State).
5. Produce radio broadcasts and TV programmes on GHG mitigation and adaptation opportunities in Delta States.
6. Arrange field visits to and from other Delta States to exchange information on experiences in developing GHG mitigation and adaptation interventions.
7. Prepare policy briefs based on the results of the TACC programme.
8. Exchange lessons learned with other climate change projects/programmes in Nigeria, particularly the AAP, through conferences and workshops (including the BNRCC project).

# C. Operational Approach: Proposed Timeline

1. Implementation is expected to start in February 2011, once the UNDP’s due diligence requirements are completed. Implementation will be structured around three key milestones as described below. The proposed work plan below will be reviewed and updated during the inception phase (as soon as the programme manager is on board) and finalized before the inception workshop expected by January 2011. The updated work plan will be presented to stakeholders during the inception workshop for their inputs, and then approved at the first Project Board meeting.

***Inception Phase*** (4 Months)

1. During the inception phase, the Project Management Unit (PMU) and the programme governance structure will be established. Then initial partnerships, coordination platforms will be established (described in Output 1) to strengthen partnerships and coordination required for the implementation of the programme activities. In addition, initial preparatory steps will be taken to enable the implementation of the core TACC activities. Activities foreseen to be concluded during the inception phase are mostly from Outputs 1, 2 and 3, and include:
* Establishment of the TACC Project Management Unit, Project board, Steering Committee and technical working groups.
* Initiation of the development and facilitation of MOUs.
* Establishment of linkages with other GHG mitigation and adaptation projects/programmes (including UNDP projects/programmes).
* Initiation of capacity development, particularly of the Steering Committee, working groups and the CCCU.
* Initiation of biophysical and socio-economic assessments.
* Initiation of vulnerability study and development of maps.
* Development of TORs for the quantification of GHG emissions.
* Initiation of all planning activities for GHG mitigation and adaptation interventions.
* Completion of prioritisation of GHG mitigation and adaptation interventions.
* Initiation of extensive consultation on priority interventions.
* Initiation of extensive consultation on priority sites for interventions.
* Initiation of capacity assessment of sectors.
* Identification of potential partner projects and public private partnerships for accessing scope of additional funding.
1. The inception workshop will be held in Delta State to be attended by a wide range of stakeholders including representatives from key federal and Delta State ministries, NGOs, researchers, the private sector, and multilateral partners including UNDP, UNEP and other relevant institutions. The TACC programme’s total budget and work plan will be presented at the inception workshop for review and comments, after which it will be presented to the Project Board for their approval. Programme implementation will then proceed according to the then revised work plans.
2. A programme inception report will be prepared immediately following the inception workshop. It will include a detailed first year annual work plan divided in quarterly time-frames detailing the activities and indicators that will guide implementation during the first year of the programme. This work plan will include the dates of specific field visits, support missions from the UNDP Country Office or consultants, as well as time frames for meetings of the programme's decision-making structures. The report will also include the detailed programme budget for the first full year of implementation, prepared on the basis of the annual work plan, and including any monitoring and evaluation requirements to effectively measure programme performance during the targeted 12 month time frame.
3. The inception report will also include a more detailed narrative on the institutional roles, responsibilities, coordinating actions and feedback mechanisms of programme related partners. In addition, a section will be included on progress to date, programme establishment and start-up activities, and an update of any changed external conditions that may affect programme implementation. Prior to adoption of the inception report, the UNDP Country Office and UNDP Environmental Energy Group (EEG) will review the document.

***Implementation Phase (12 months)***

1. During this phase, all baseline assessment, technical studies, essential capacity building, which are all necessary to develop the ITCP will be undertaken and/or completed. Activities under all four outputs will take place during this phase, and will include (but not be limited to):
* Completion of the development and facilitation of MOUs.
* Continuation of capacity development, particularly of the Steering Committee, working groups and the CCCU.
* Completion of biophysical and socio-economic assessments.
* Completion of vulnerability study and development of maps.
* Continuation of all planning activities for GHG mitigation and adaptation interventions.
* Completion of prioritisation of GHG mitigation and adaptation interventions.
* Implementation of interventions.
* Development of feasibility studies, TORs and bankable business plans.
* Development of a climate profile.
* Development of an ITCP.
* Undertake review of policies, legislation and institutional arrangements.
* Initiate revision of appropriate policies, legislation and institutional arrangements.
* Develop knowledge sharing activities and disseminate best practices.
* Develop modules for school and university curricula.
* Arrange field visits to other States for knowledge sharing.

***Strategic Planning Phase (8 months)***

1. During this phase, the majority of actions implemented are from Outputs 2, 3 and 4.In addition, as this is the final phase of the programme, all programme activities under all outputs must be completed at the end of this phase. Activities under this phase include (but are not limited to):
* Continuation of capacity development, particularly of the Steering Committee, working groups and the CCCU.
* Implementation of interventions and lessons learned and knowledge arising from interventions disseminated.
* Completion of and dissemination of feasibility studies, TORs and bankable business plans.
* Completion of and dissemination of climate profile.
* Completion of the ITCP.
* Endorsement of the ITCP.
* Revision of policies, legislation and institutional arrangements.
* Continue revision of appropriate policies, legislation and institutional arrangements.
* Development of and dissemination of policy briefs to decision makers.
* Evaluation of programme success.
* Capture lessons learned and best practices to be disseminated via websites through national programmes such as the AAP.

# D. Results and Resources Framework

|  |
| --- |
| **Intended Outcome as stated in the Country Programme Results and Resource Framework:** Environmental governance at Federal level and in selected States based increasingly on policy, legal and regulatory frameworks and actions that are more likely to protect natural resources as well as livelihoods; and ii) a minimum threshold of national action on climate change achieved.*[To be confirmed by Country Office]* |
| **Outcome indicators as stated in the Country Programme Results and Resources Framework, including baseline and targets:****Target:**By 2011, the Federal Government and up to 13 States have all the technical, financial and institutional development proposals and programmes required to review, reform, pass and implement policies and legislation for strengthened environmental governance.**Indicator:*** % of the public aware of and concerned about the impact of the key environmental challenges facing Nigeria and their particular States
* Quality, age and relevance of data on key climate change indicators available at Federal level (for the country)
* % of key institutions (including EPAs) at Federal and State level that have institutionalised and functioning mechanisms for public and civil society participation in environmental decision-making and information-sharing
* % of the judiciary knowledgeable and trained on environmental law
* Number of cases for breach of environmental law that are lodged in Nigeria annually and the % that are successfully adjudicated within 2-3 years
* % of State EPAs that meet internal benchmarks on the clarity and legal basis of their mandates, coordination arrangements with other MDAs, work force development and retention, and access to essential operational and management resources (based on capacity assessments)

A network of expert practitioners available to advice on environmental governance and enable citizens to scrutinise adherence by the public and private sectors to environmental laws and, if necessary, take action based on the rule of law |
| **Applicable Key Result Area:** *[To be inserted by Country Office]* |
| **Partnership Strategy:** *[To be inserted by Country Office]* |
| **Programme title and ID (ATLAS Award ID):** *[To be inserted by Country Office]* |
| **Intended Outputs** | **Indicator/s** | **Baseline** | **Target** | **Indicative Activities** | **Timeframe** | **Inputs** |
| **Y1** | **Y2** |
| **Output 1**: Biophysical and socio-economic assessment of the nexus of environmental degradation and climate change undertaken. |  |  |  | * 1. Establish technical working groups on key sectors under Delta State Climate Change Coordination Unit (CCCU).
	2. Conduct in-depth, cross-sectoral studies on the nexus between environmental degradation and climate change impacts in Delta State.
	3. Establish linkages with the UNDP Niger Delta Project (see Past and Ongoing Activities Section).
	4. Develop the TORs for the quantification of present and future GHG emissions by sector in Delta State.
 | X |  X | Technical Working GroupsPMU |
| A Climate Profile is developed for Delta State (yes/no). | A Climate Profile has not been developed for Delta State. | By the end of the programme, a Climate Profile has been developed for Delta State and included as part of the ITCP.  |
| The most vulnerable regions and communities within Delta State are detailed within a vulnerability map (yes/no). | Vulnerability assessments and mapping exercises related have not yet been undertaken within Delta State. | Mid-way through the programme, a map detailing vulnerability has been developed. |
| TORs for the quantification of present and future GHG emissions by sector have been developed (yes/no). | Present and future GHG emissions have not been quantified for Delta State.  | Mid-way through the programme, TORs have been developed for the quantification of present and future GHG emissions by sector. |  |  |
| **Output 2**: Plans for GHG mitigation and adaptationinterventions developed in Delta State, in both the public and private sector.  | A comprehensive list of potential GHG mitigation and adaptation interventions for Delta State is developed (yes/no). | Information regarding GHG mitigation and adaptation interventions are not widely known in Delta State and a list of interventions is not available. | Mid-way through Year 1, a comprehensive list of potential GHG mitigation and adaptation interventions for Delta State has been developed and included within the ITCP.  | * 1. Develop a comprehensive list of potential GHG mitigation and adaptation interventions for Delta State.
	2. Prioritise GHG mitigation and adaptation interventions within the comprehensive list developed in Activity 2.1.
	3. Conduct feasibility studies on five of the prioritised interventions.
	4. Develop TORs for feasibility studies for an additional five of the prioritised interventions.
	5. Develop bankable business plans for three of the interventions for which feasibility studies were conducted.
	6. Identify and consult stakeholders within government, private sector, NGO sector and civil society on the priority interventions.
	7. Assess the capacity of different sectors to implement the priority interventions.
	8. Build capacity for the implementation of GHG mitigation and adaptation interventions where appropriate[[189]](#footnote-189).
	9. Identify innovative funding mechanisms for the priority interventions.
	10. Create an enabling policy and institutional environment for GHG mitigation and adaptation interventions.
	11. Develop a set of scientifically-based guidelines, protocols and best practices for environmental management (including oil spill clean ups) and restoration projects. This activity will be linked to the cumulative impacts assessment to be undertaken within Delta State (see paragraph xx).
	12. Based on activities above, develop a Climate Change Strategy and Integrated Territorial Climate Plan (ITCP) for guiding bankable GHG mitigation and adaptation interventions in the public and private sector of Delta State.
	13. Mainstream the ITCP principles into key sectors[[190]](#footnote-190) in Delta State (including the three districts: Delta North, Delta South and Delta Central) and into national planning, policy-making and decision-making (see Output 4).
 |  |  | Working GroupsPMUInternational consultantsLocal consultants |
| Number of feasibility studies undertaken for prioritised interventions. | Capacity is presently lacking within Delta State to undertake feasibility studies.  | Mid-way through the programme, at least five feasibility studies have been conducted on five prioritised interventions. |
| Number of TORs developed for feasibility studies for an additional five priority interventions. | Capacity is presently lacking within Delta State to develop TORS for the development of feasibility studies. | Mid-way through the programme, at least five TORs for feasibility studies have been conducted on five additional prioritised interventions. |
| Number of bankable business plans developed for prioritised interventions. | Capacity is presently lacking within Delta State to develop business plans for prioritised interventions. | Mid-way through Year 2, at least three bankable business plans have been developed for three prioritised interventions.  |
| Number of policies revised to incorporate climate change risks and GHG mitigation considerations.  | At present, an enabling environment to catalyse GHG mitigation and adaptation does not exist within Delta State as GHG mitigation and adaptation considerations have not been mainstreamed into policy.  | By the end of the programme, revisions of at least two cross-sectoral policies have been proposed.  |
| An ITCP has been developed for Delta State (yes/no). | An ITCP has not been developed for Delta State to date.  | By the end of the programme, an ITCP has been developed and externally reviewed and approved for Delta State.  |  |  |  |
| **Output 3**: GHG mitigation and adaptationinterventions piloted in communities most vulnerable to climate change impacts.  | Number of hectares of mangroves to be restored.  | Mangroves within Delta State are frequently affected by oil spills. Additionally, mangrove restoration programmes have not yet been extensively undertaken within Delta State and appropriate restoration protocols are consequently not known.  | By the end of the programme, at least 15 ha([[191]](#footnote-191)) have been restored as a result of programme activities.  | 1. Identify potential partner projects and public private partnerships in order to determine the scope for additional funding for this intervention and/or to bolt this intervention onto an ongoing activity.
2. Identify demonstration site(s) following a transparent and participatory process. Communities should be nominated, for example, to avoid potential inter-community conflict. This should also be based on the mapping exercise undertaken through Output 1.
3. Implement the intervention based on consultation with local authorities and communities.
4. Establish a monitoring system for implemented actions to determine their relative success and cost-effectiveness. Where possible, this should be undertaken by local NGOs.
 | X | X | Working GroupsPMUInternational consultantsLocal consultants |
| Number of fuel-efficient stoves installed and operating. [*To be determined during the Inception Phase following acceptance of the proposed interventions and through detailed budgetary analysis.]* | Rural communities within Delta State rely largely on fuelwood for their energy requirements which has lead to deforestation and destruction of the mangroves. Consequently, there is a need for alternative and more efficient energy sources. | *The number of fuel-efficient stoves to be installed by the TACC programme will be determined during the Inception Phase.* |
| The number of solar-powered transportable fridges to be provided by the TACC programme. [*To be determined during the Inception Phase following acceptance of the proposed interventions and through detailed budgetary analysis.]* | The number of solar-powered transportable fridges for transporting vaccines and samples is presently limited within Delta State, which is problematic given climate change’s likely impact on the health sector.  | *The number of solar-powered transportable fridges provided by the TACC programme will be determined during the Inception Phase.* |
| **Output 4**: Best practices for development of GHG mitigation and adaptationinterventionsdisseminated to national government and to local authorities in other states within the Niger Delta. | Number of men and women aware of climate change vulnerability and appropriate GHG mitigation and adaptation responses. | At present, rural communities’ understanding of climate change and its impacts is minimal. The baseline will be determined in the inception phase. A survey is needed. | By the end of the programme, a 20% increase in the number of men and women who are aware of climate change vulnerability and appropriate GHG mitigation and adaptation responses has occurred relative to the baseline. | 1. Present the TACC programme results to parliamentarian working groups.
2. Develop modules for school and university curricula on GHG mitigation and adaptation options for Delta States (establish linkages and learn lessons from the BNRCC youth programme within Delta State).
3. Produce radio broadcasts and TV programmes on GHG mitigation and adaptation opportunities in Delta States.
4. Arrange field visits to and from other Delta States to exchange information on experiences in developing GHG mitigation and adaptation interventions.
5. Prepare policy briefs based on the results of the TACC programme.
6. Exchange lessons learned with other climate change projects/programmes in Nigeria particularly the AAP, through conferences and workshops (including the BNRCC project).
 |  | X | Working GroupsPMUInternational consultantsLocal consultants |
| Number of knowledge products generated and disseminated. | N/A. | By the end of the programme, programme lessons have been disseminated via radio broadcasts, TV programmes and policy briefs. Additionally, at least two modules for school and university curricula on GHG mitigation and adaptation options for Delta States have been developed by the end of the programme. |

# E. Budget and Annual Work Plan

**Budget by output:**

|  |  |
| --- | --- |
| **Outputs** | **Amount, US$** |
| **Output 1**: Biophysical and socio-economic assessment of the nexus of environmental degradation and climate change undertaken. | 161,000 |
| **Output 2**: Plans for GHG mitigation and adaptation interventions developed in Delta State, in both the public and private sector.  | 179,000 |
| **Output 3**: GHG mitigation and adaptation interventions piloted in communities most vulnerable to climate change impacts.  | 231,000 |
| **Output 4**: Best practices for development of GHG mitigation and adaptation interventions disseminated to national government and to local authorities in other states within the Niger Delta. | 90,000 |
| Project management  | 277,000 |
| M&E | 62,000 |
| **Total** | **1,000,000** |

**Year 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Expected Outputs | Time Frame | Responsible Party | Funding Source | Planned Budget |
| Q1 | Q2 | Q3 | Q4 | Code | Budget Description | Amount (US$) |
| **Output 1:** Biophysical and socio-economic assessment of the nexus of environmental degradation and climate change undertaken. | x | x | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 50,000 |
| 71300 | Local consultants | 15,000 |
| 71600 | Travel | 15,000 |
| 72300 | Materials and goods | 25,000 |
| 72200 | Equipment | 22,000 |
|   |   |   | Sub-total | 127,000 |
| **Output 2**: Plans for GHG mitigation and adaptation interventions developed in Delta State, in both the public and private sector.  | x | x | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 37,500 |
| 71300 | Local consultants | 21,000 |
| 72100 | Contractual Services | 13,000 |
| 71600 | Travel | 9,000 |
| 72300 | Materials and goods | 13,000 |
| 74200 | Audio-visual equipment | 9,000 |
|   |   |   | Sub-total | 102,500 |
| **Output 3**: GHG mitigation and adaptation interventions piloted in communities most vulnerable to climate change impacts.  |   |   | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 20,000 |
|   |   | 71300 | Local consultants | 6,000 |
|   |   | 71600 | Travel | 4,000 |
|   |   | 72300 | Materials and goods | 10,000 |
|   |   | 72200 | Equipment | 10,000 |
|   |   | 72100 | Contractual Services | 11,000 |
|   |   | 74500 | Miscellaneous | 2,000 |
|   |   |   |   |   | Sub-total | 63,000 |
| **Output 4**: Best practices for development of GHG mitigation and adaptation interventions disseminated to national government and to local authorities in other states within the Niger Delta. |   |   | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 12,000 |
|   |   | 71300 | Local consultants | 5,500 |
|   |   | 72100 | Contractual Services | 7,000 |
|   |   | 74500 | Miscellaneous | 2,750 |
|   |   |   |   |   | Sub-total | 27,250 |
| Monitoring and Evaluation |   |   | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 11,000 |
|   |   | 74500 | Miscellaneous | 11,000 |
|   |   |   | Sub-total | 22,000 |
| Project Management  | x | x | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 30,000 |
|   | 71300 | Local consultants | 25,000 |
|   | 72500 | Supplies | 22,500 |
|   | 72200 | Equipment | 92,000 |
|   |   |   |   |   |   |   |   | Sub-total | 174,500 |
| TOTAL |   |   |   |   |   |   |   |   | 516,250 |

**Year 2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Expected Outputs | Time Frame | Responsible Party | Funding Source | Planned Budget |
| Q1 | Q2 | Q3 | Q4 | Code | Budget Description | Amount (US$) |
| **Output 1**: Biophysical and socio-economic assessment of the nexus of environmental degradation and climate change undertaken. | x | x |   |   | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants |  10,000  |
| 71300 | Local consultants |  7,000  |
| 71600 | Travel |  5,000  |
| 72300 | Materials and goods |  5,000  |
| 72200 | Equipment |  7,000  |
|   | Sub-total |  34,000  |
| **Output 2**: Plans for GHG mitigation and adaptation interventions developed in Delta State, in both the public and private sector.  | x | x | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants |  37,500  |
| 71300 | Local consultants |  21,000  |
| 72100 | Contractual Services | 30000  |
| 71600 | Travel |  9,000  |
| 72300 | Materials and goods | 4000  |
| 74200 | Audio-visual equipment | 2,000  |
|   | Sub-total | 76,500  |
| **Output 3:** GHG mitigation and adaptation interventions piloted in communities most vulnerable to climate change impacts.  | x | x | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 34,000  |
| 71300 | Local consultants |  1,000  |
| 71600 | Travel |  8,000  |
| 72300 | Materials and goods |  30,000  |
| 72200 | Equipment |  40,000  |
| 72100 | Contractual Services | 40,000  |
| 74500 | Miscellaneous |  6,000  |
|   | Sub-total |  168,000  |
| **Output 4**: Best practices for development of GHG mitigation and adaptation interventions disseminated to national government and to local authorities in other states within the Niger Delta. | x | x | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants | 26,000  |
|   |   |   |   | 71300 | Local consultants |  11,500  |
|   |   |   |   | 72100 | Contractual Services | 19,000  |
|   |   |   |   | 74500 | Miscellaneous | 6,250  |
|   |   |   |   |   | Sub-total | 62,750  |
| Monitoring and Evaluation |   |   |   |   | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants |  25,000  |
| 74500 | Miscellaneous |  15,000  |
|   | Sub-total |  40,000  |
| Project Management  | x | x | x | x | Delta State Ministry of Environment | Delta State Government | 71200 | International Consultants |  30,000  |
| 71300 | Local consultants |  25,000  |
| 72500 | Supplies |  22,500  |
| 72200 | Equipment |  20,000  |
|   | Sub-total |  97,500  |
| TOTAL |   |   |   |   |   |   |   |   | 483,750  |

# F. Management Arrangements and Coordination Structures

Global UNDP Network (TACC Facilities & Partners, Regional Service Center, External Support)

**Special Climate Change Unit**

**TACC Steering Committee**

**Climate Change Coordination Unit**

**PMU**

**PM**

**UNDP**

**Project Board**

CTA

FAA

DTSG Climate Change Advisory Council

**Figure 5.** A schematic overview of the TACC programme’s governance and coordination structure.

1. This TACC programme is a component of the global “Down to Earth: Territorial Approach to Climate Change” programme[[192]](#footnote-192). It will be implemented through the United Nations Development Programme (UNDP) and execution will be based on the National Execution Modality (NEX). Delta State’s CCCU within Delta State Ministry of Environment (MoE) will be the government agency responsible for programme implementation.
2. The programme will ensure participation from a broad range of stakeholders to reduce institutional barriers and capitalise on knowledge and resources available in all sectors of society. Current adaptation and mitigation projects and activities will be enhanced and built upon to ensure that synergies are identified and fully realised. Development of capacity at all institutional levels as well as changes in policy will enhance the long-term success of the programme and facilitate the leveraging of follow-up funding.
3. Implementation arrangements shall foster linkages between i) national government; ii) Delta State authorities responsible for climate change policies; ii) local authorities responsible for project implementation; iii) partner organisations providing technical expertise and guidance; and iv) on-the-ground practitioners of climate change adaptation activities.
4. The section below outlines the programme management and coordination structures, which will be reviewed and finalized during the inception phase. The TACC programme will see additional partnerships emerging through time, and consequently the management structures have some flexibility to ensure that such partnerships can be readily integrated into the programme.

**Programme Implementation Arrangements**

1. It is critical that a participatory governance structure is developed in order to support the adoption of low emission and climate-resilient development. As such, the TACC programme will develop a multi-stakeholder Programme Steering Committee (PSC). This body will be housed in the CCCU, and will act as an institutional platform promoting and managing GHG mitigation and adaptation interventions across different sectors within Delta State (see Annex 7 for the TORs for the Steering Committee).
2. A Programme Management Unit (PMU) will be established and will be responsible for the day-to-day implementation of all programme activities, including direct supervision of those activities contracted to appropriate ministries, institutions and partner organisations. The specific responsibilities of each ministry and institution are not detailed at this point, but will be derived through a participatory workshopping process. All partner institutions will be encouraged to integrate the project activities within their own current programmes and plans, enhancing mainstreaming and developing ownership of the project.
3. An understanding of the current biophysical environment and of the likely impacts climate change will have on natural ecosystems is limited within Delta State. This lack of information hinders the identification and implementation of appropriate GHG mitigation and adaptation technologies. The TACC programme will consequently establish multi-stakeholder technical working groups and build capacity within the public and private sector for undertaking the necessary biophysical and socio-economic assessments (see paragraph ).

**Delta State Government Climate Change Advisory Council**

1. This will be a purely an advisory council established by the Executive Governor of Delta State who acts as the Chairman for the TACC Programme that meets twice a year. The TACC Programme Manager acts as the Secretary to the council with other membership comprising of the respective Commissioners for Environment, Agriculture, Energy, Transport, Water Resources, Health, Basic Education, Science and Technology, the Permanent Secretary Ministry of Environment and the Head Climate Change Coordination Unit.

***Programme Steering Committee (PSC)***

1. The PSC will comprise members of the CCCU, representatives from the Federal Special Climate Change Unit (SCCU), the UNDP Nigeria Country Office and representatives from relevant ministries in Delta State, to ensure policy consistencies. Additional PSC members will be invited from civil society and key partner organisations, such as the NDDC, DESOPADEC, and oil companies operating in the delta. This governance structure will be further developed and agreed upon by stakeholders during the Inception Phase.
2. The PSC will take full responsibility for overall consultation, coordination and collaboration within the programme. It will make policy decisions, guide and oversee the progress of the project, and review delivery targets and budgets. The PSC will also be responsible for creating the working groups to investigate specific policy and project issues. With support from the working groups, the PSC will be responsible for the development of the ITCP for Delta State.
3. Within the PSC, the Executive role will be held by the permanent secretary of the MoE (or an official delegated the permanent secretary). His/her role will be to ensure coordination with state-level and national-level climate change policy, and represent the interests of the programme owner. The Senior Supplier role will be filled by a member of the UNDP Project Board. His/her role will be to provide guidance regarding the technical feasibility of project activities. Project Assurance will also be the responsibility of UNDP, who will recruit and pay for a Programme Officer (Project Support). His/her functions will include provision of objective and independent oversight, monitoring and ensuring appropriate project management milestones are managed and completed. The Senior Beneficiary role will include representatives of the CCCU and each of the three districts (Delta Central, Delta North and Delta South). Their role will be to ensure the realisation of project benefits from the perspective of project beneficiaries.
4. The PSC will meet at least three times a year, and will ensure that the TACC programme is in line with the agreed project document, and the climate change frameworks outlined by the SCCU and CCCU. The TORs for the PSC, which will be reviewed and finalized during the inception phase, are found in Annex 7.

***Programme Management Unit (PMU)***

1. The PMU will be responsible for the day-to-day implementation of all programme activities, including direct supervision of those activities contracted to consultants. The PMU will be housed within Delta State Ministry of Environment, and its roles will be to: i) ensure all ministries and implementing agencies are complying with their project commitments; ii) provide technical support and expertise for climate change mitigation and adaptation issues; iii) coordinate meetings with implementing agencies; iv) undertake monitoring and evaluation; v) manage finances and undertake budget revisions; and vi) undertake all reporting commitments.
2. The PMU will consist of a Programme Manager (PM), a Chief Technical Advisor (CTA) in a part-time role and a Finance and Administrative Assistant (FAA) and two other supporting staff. The PM will be the head of the CCCU in the State, a director in the Ministry of Environment. The supporting staff will be members of the CCCU while the FAAA will be a staff memberform the Account Department in the Ministry of Environment. The CTA will be appointed by the UNDP Country Office. In addition, national and international technical consultants will be contracted to oversee and advise on all project activities.
3. The PM will be responsible for the management and coordination of the programme, and ensuring synergy with all other adaptation and mitigation initiatives within Delta State. The CTA will provide technical expertise on climate change mitigation and adaptation issues to the PMU and implementing partners, and will coordinate the activities of the technical consultants. The CTA will also ensure the coordination and harmonisation between programme activities in Delta State and national climate change strategies and interventions coordinated by the Special Climate Change Unit. The FAA will ensure that the PMU maintains records and controls to ensure the accuracy and reliability of the annual work plan’s financial information. TORs for the PM, CTA and FAA are found in Annex 7.

***Working Groups (WGs)***

1. Technical working groups will be established to focus on key climate change-related topics (covering both GHG mitigation and adaptation) within relevant sectors, including: i) health; ii) water; iii) energy; iv) agriculture; v) forestry; vi) fisheries; and vii) tourism. These technical working groups will comprise stakeholders from Delta State ministries, local authorities, academic institutions, NGOs and the private sector.
2. The technical working groups will act as a mechanism for empowering local authorities and foster multi-stakeholder governance. They will promote policy dialogue related to climate change and necessary GHG mitigation and adaptation interventions to be undertaken by local authorities. Pivotal to the role of the technical working groups will be their contribution to: i) the development of a climate profile for Delta State (see Annex 4), which will include risk information and opportunities related to the implementing of GHG mitigation and adaptation technologies; ii) the development of low-carbon and climate-resilient development strategies; iii) the identification of capacity deficits, i.e. where capacity building is required; and iv) the development of bankable project ideas and feasibility studies.
3. The membership of each WG will consist of experts and representatives from relevant Delta State ministries, local authorities, academic and research institutions, NGOs, the private sector and civil society.

# G. Monitoring Framework and Evaluation

1. In accordance with the programming policies and procedures outlined in the UNDP User Guide, the project will be monitored through the following:
2. Within the annual cycle:
* **Quarterly Progress Report (QPR).** A quarterly Report shall be prepared by the Project Manager and shared with the Project Board. The following will contribute towards the compilation of QPRs:
	+ On a quarterly basis, a quality assessment will be undertaken by the Project Manager in order to record progress towards the completion of key results.
	+ An Issue Log will be activated in Atlas and updated by the Project Manager to facilitate tracking and resolution of potential problems or requests for change.
	+ Based on the initial risk analysis submitted (see Annex 1), a risk log will be activated in Atlas and regularly updated by reviewing the external environment that may affect the project implementation.
	+ Based on the above information recorded in Atlas, a Project Progress Reports (PPR) will be submitted by the Project Manager to the Project Board through Project Assurance, using the standard report format available in the Executive Snapshot.
	+ A project lessons learned log will be activated and regularly updated to ensure on-going learning and adaptation within the organization, and to facilitate the preparation of the lessons learned Report at the end of the project.
	+ A Monitoring Schedule Plan will be activated in Atlas and updated to track key management actions/events.
1. Annually:
* **Annual Review Report**. An Annual Review Report will be prepared by the Project Manager and shared with the Project Board. As a minimum requirement, the Annual Review Report will consist of the Atlas standard format for the Quarterly Progress Report (QPR) covering the whole year with updated information for each above element of the QPR as well as a summary of results achieved against pre-defined annual targets at the output level.
* **Annual Project Review**. Based on the above report, an annual project review exercise will be conducted during the fourth quarter of the year or soon after, to assess the performance of the project and appraise the Annual Work Plan (AWP) for the following year. In the last year, this review will be a final assessment. This review will be driven by the Project Board and may involve other stakeholders as required. It will focus on the extent to which progress is being made towards outputs, and that these remain aligned to appropriate outcomes.
1. Final Report:
* A **Draft Final Report** will be prepared four weeks before the end of the project implementation period.
* A **Final Report** will then be submitted, incorporating comments from the beneficiary, UNDP and the donor within four weeks of receiving the comments from all the entities. This should describe the work done and the achievements of the project against its original objectives, clearly identifying any constraints that have limited the achievement of objectives. It should make recommendations for future developments and record lessons learned.
1. Day-to-day monitoring of implementation progress will be the responsibility of the Project Manager, based on the project's Annual Workplan and its indicators. The Project Manager will be responsible for the preparation and submission of the reports that form part of the monitoring process. The Project Management Unit will inform the UNDP CO of any delays or difficulties faced during implementation so that the appropriate support or corrective measures can be adopted in a timely manner. The PMU will submit a Quarterly Progress Report describing progress, outputs, achievements, challenges and results of the project.
2. Periodic monitoring of implementation progress will be undertaken by the Project Board, under the coordination of UNDP CO. The Project Board will meet biannually or more frequently as deemed necessary. This will allow parties to solve any problems pertaining to the project in a timely fashion to ensure smooth implementation of the project activities.

**Financial reporting and auditing as per UNDP Financial Regulations:**

1. As per the above mentioned financial regulations, Delta State Government will submit reports in the formats provided by UNDP clearly agreed upon at the inception workshop as per the HACT & FACE guidelines. UNDP may request additional reports, if applicable; to be submitted by Delta State Government should partners/donors supporting the project require any additional reports. Delta State Government will prepare a final financial report and submit it to the UNDP Resident Representative no later than two weeks after project completion or following the termination of the present agreement as per the CPAP. An inventory of supplies and equipment will be attached to the report.

**Audit Clause**

1. Delta State Government will provide the UNDP Resident Representative with certified periodic financial statements, and with an annual audit of the financial statements relating to the status of UNDP managed activities according to the established procedures set out in the UNDP Programming and Finance manuals. The Audit will be conducted by a legally recognized auditor or by a commercial auditor engaged by Delta State Government.

**Evaluation**

1. A detailed schedule of project reviews (including annual project review exercise described above) will be developed by the PMU in consultation with project implementation partners, Project Board/ITCP members, and stakeholder representatives. An external evaluation may be required by the UNDP. This evaluation will be planned for if necessary and its timing will be confirmed during the inception phase of the project.

# H. Legal Context

1. This document, together with the CPAP signed by the Government and UNDP which is incorporated by reference, together constitute a Project Document as referred to in the Standard Basic Assistance Agreement (SBAA) and all CPAP provisions apply to this document.
2. Consistent with the Article III of the SBAA, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP’s property in the implementing partner’s custody, rests with the implementing partner.
3. The implementing partner shall:
4. put in place an appropriate security plan and maintain the security plan, taking into account the security situation in Delta State;
5. Assume all risks and liabilities related to the implementing partner’s security, and the full implementation of the security plan.
6. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.
7. The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

# I. Annexes

# ANNEX 1. Risk Analysis:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **#** | **Description** | **Date Identified** | **Type** | **Probability & Impact** | **Countermeasures / Mngt response** | **Owner** |
| 1 | Participation of certain key stakeholders wanes during programme implementation. | During programme document development | Organizational, Political | Probability – MediumCross-sectoral approach might not be successful if certain sectors are not involved in the programme’s design and implementation due to their focus shifting to higher priority problems, which could limit the scope of the action plan or hamper implementation of planned actions. | Participatory approach of the programme. | Programme Manager;Programme Board;ITCP Steering Committee;Climate Change Coordination Unit. |
| 2 | Inter-community conflict arises as a result of site selection for priority interventions. | During programme document development | Political | Probability – MediumCommunities could resort to conflict if the selection of sites for the priority interventions is not undertaken in a participatory and sensitive manner. | Participatory approach of the programme, particularly with regards to demonstration site selection. | Programme Manager;Programme Board;ITCP Steering Committee. |
| 3 | Competing activities for land use could prevent the implementation of priority interventions. | During programme document development | Strategic and political | Probability – Low Land uses other than those employed by the priority interventions may be considered of higher priority and thus prevent the implementation of identified priority interventions in identified demonstration sites. | The programme will plan interventions in close collaboration with local communities to avoid conflicts of interest. | Programme Manager;Programme Board;ITCP Steering Committee. |
| 4 | Priority interventions implemented are not found to be cost-effective. | During programme document development | Strategic | Probability – Low Demonstrations projects found not to be cost-effective will not be upscaled to additional sites within Delta State and will thus reduce the upscale potential of the programme’s priority interventions. | Cost-effectiveness will be a core principle in the implementation of adaptation measures. Detailed information will be recorded regarding cost effectiveness, which will be of use to future adaptation endeavours and will be widely disseminated. | Programme Manager;Programme Board;ITCP Steering Committee. |

# ANNEX 2. A Generic Workplan for the TACC Project Implementation

| **Model timeline of activities** | **Y1** | **Y2** |  |
| --- | --- | --- | --- |
| **Q1** | **Q2** | **Q3** | **Q4** | **Q1** | **Q2** | **Q3** | **Q4** |  |
| **Output 1: Biophysical and socio-economic assessment of the nexus of environmental degradation and climate change undertaken.** |  |
| 1. **Establish technical working groups on key sectors under Delta State Climate Change Coordination Unit (CCCU).**
 |  |  |  |  |  |  |  |  |  |
| Build capacity of the newly formulated Delta State CCCU and the technical working groups. |  |  |  |  |  |  |  |  |  |
| Develop and facilitate the signing of Memorandums of Understanding (MOUs) between key Delta State ministries to provide human resources to form part of the CCCU and technical working groups. |  |  |  |  |  |  |  |  |  |
| Build capacity within the public and private sector (including technicians) for undertaking quantitative environmental and climate change impact assessments. |  |  |  |  |  |  |  |  |  |
| Establish linkages for cross-learning with other large GHG mitigation and adaptation projects in Nigeria and other Nigerian states e.g. the proposed UNDP Niger Delta Conservation Project and the REDD+ project in Cross River State. |  |  |  |  |  |  |  |  |  |
| Collate information collected by technical working groups and develop a climate profile for Delta State.  |  |  |  |  |  |  |  |  |  |
| 1. **Conduct in-depth, cross-sectoral studies on the nexus between environmental degradation and climate change impacts in Delta State.**
 |  |  |  |  |  |  |  |  |  |
| Identify the most vulnerable regions and communities within Delta State, and present results in Geographic Information Systems (GIS) map-based formats.  |  |  |  |  |  |  |  |  |  |
| Utilise the results of the studies to identify priority GHG mitigation and adaptation interventions (Output 3).  |  |  |  |  |  |  |  |  |  |
| Collate and include information from the studies in the climate profile developed for Delta State. |  |  |  |  |  |  |  |  |  |
| 1. **Establish linkages with the UNDP Niger Delta Project (see Past and Ongoing Activities Section).**
 |  |  |  |  |  |  |  |  |  |
| 1. **Develop the TORs for the quantification of present and future GHG emissions by sector in Delta State.**
 |  |  |  |  |  |  |  |  |  |
| **Output 2: Plans for GHG mitigation and adaptation interventions developed in Delta State, in both the public and private sector.** |  |
| 1. **Develop a comprehensive list of potential GHG mitigation and adaptation interventions for Delta State.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Prioritise GHG mitigation and adaptation interventions within the comprehensive list developed in Activity 2.1.**
 |  |  |  |  |  |  |  |  |  |
| Undertake cost-benefit analyses and calculate which IRRs will provide information related to the likely costs and potential returns of proposed interventions (working closely with the Economic Planning Ministry). |  |  |  |  |  |  |  |  |  |
| Assess opportunities and constraints for the GHG mitigation and adaptation interventions based on: i) information produced in Output 1; and ii) the GHG Mitigation Options Assessment for Nigeria (2000 – 2040). |  |  |  |  |  |  |  |  |  |
| 1. **Conduct feasibility studies on five of the prioritised interventions.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Develop TORs for feasibility studies for an additional five of the prioritised interventions.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Develop bankable business plans for three of the interventions for which feasibility studies were conducted.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Identify and consult stakeholders within government, private sector, NGO sector and civil society on the priority interventions.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Assess the capacity of different sectors to implement the priority interventions.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Build capacity for the implementation of GHG mitigation and adaptation interventions where appropriate.**
 |  |  |  |  |  |  |  |  |  |
| Conduct training on the development of business plans for priority interventions. |  |  |  |  |  |  |  |  |  |
| 1. **Identify innovative funding mechanisms for the priority interventions.**
 |  |  |  |  |  |  |  |  |  |
| Build capacity of the public and private sector to access the innovative funding mechanisms (e.g. training in funding proposal writing as well as in PDD design and development). This will also involve linking with the TRAIN campaign (see Past and Ongoing Activities Section) |  |  |  |  |  |  |  |  |  |
| Advise Delta State decision-makers on the most appropriate funding mechanisms for undertaking the identified high priority interventions. |  |  |  |  |  |  |  |  |  |
| 1. **Create an enabling policy and institutional environment for GHG mitigation and adaptation interventions.**
 |  |  |  |  |  |  |  |  |  |
| Review existing policies, legislation and institutional arrangements pertinent to large-scale cross-sectoral interventions. |  |  |  |  |  |  |  |  |  |
| Propose revisions to policy and legislation that will catalyse GHG mitigation and adaptation interventions. |  |  |  |  |  |  |  |  |  |
| Assess and develop structures for the flow of funds in REDD+ projects, and other GHG mitigation projects i.e. determine ownership of CERs and how funds will flow to community beneficiaries.  |  |  |  |  |  |  |  |  |  |
| 1. **Develop a set of scientifically-based guidelines, protocols and best practices for environmental management (including oil spill clean ups) and restoration projects. This activity will be linked to the cumulative impacts assessment to be undertaken within Delta State.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Based on activities above, develop a Climate Change Strategy and Integrated Territorial Climate Plan (ITCP) for guiding bankable GHG mitigation and adaptation interventions in the public and private sector of Delta State.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Mainstream the ITCP principles into key sectors[[193]](#footnote-193) in Delta State (including the three districts: Delta North, Delta South and Delta Central) and into national planning, policy-making and decision-making (see Output 4).**
 |  |  |  |  |  |  |  |  |  |
| **Output 3: GHG mitigation and adaptation interventions piloted in communities most vulnerable to climate change impacts.**  |  |
| 1. **Identify potential partner projects and public private partnerships in order to access scope for additional funding for this intervention and/or to bolt this intervention onto an ongoing activity.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Identify demonstration site(s) following a transparent and participatory process. Communities should be nominated, for example, to avoid potential inter-community conflict. This should also be based on the mapping exercise undertaken through Output 1.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Implement the intervention based on consultation with local authorities and communities.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Establish a monitoring system for implemented actions to determine their relative success and cost-effectiveness. Where possible, this should be undertaken by local NGOs.**
 |  |  |  |  |  |  |  |  |  |
| **Output 4: Best practices for development of GHG mitigation and adaptation interventions disseminated to national government and to local authorities in other states within the Niger Delta.**  |  |
| 1. **Present the TACC programme results to parliamentarian working groups.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Develop modules for school and university curricula on GHG mitigation and adaptation options for Delta States (establish linkages and learn lessons from the BNRCC youth programme within Delta State).**
 |  |  |  |  |  |  |  |  |  |
| 1. **Produce radio broadcasts and TV programmes on GHG mitigation and adaptation opportunities in Delta States.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Arrange field visits to and from other Delta States to exchange information on experiences in developing GHG mitigation and adaptation interventions.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Prepare policy briefs based on the results of the TACC programme.**
 |  |  |  |  |  |  |  |  |  |
| 1. **Exchange lessons learned with other climate change projects/programmes in Nigeria, particularly the AAP, through conferences and workshops (including the BNRCC project).**
 |  |  |  |  |  |  |  |  |  |

# ANNEX 3. Identification of potential alternative markets and/or investments to undergo feasibility studies

The following are a list of some potential alternative markets or investment pathways that are either carbon neutral or improve community resilience to climate change. This is not an exhaustive list, and should not be seen as such, but rather as the beginning of a list of potential bankable projects that could be undertaken under TACC and the ITCP. All selected projects should initially undergo feasibility studies including legal aspects and detailed cost-benefit analyses or other appropriate economic analyses to inform decision-making on adaption. Selected projects should undergo limited-scale pilot and be assessed for upscaling potential.

**Agriculture and Forestry**

1.1. **Develop and implement effective land use planning and zoning**

Delta State government should ensure that effective land use planning and zoning, which identifies where different activities and/or development projects is carried out by relevant state line ministries. The land use planning and zoning should be participatory, involving all stakeholder groups, especially the rural communities who form an integral part of Delta State. These rural communities are dependent on the natural resource base for their survival and prosperity e.g. through subsistence agriculture (mainly slash and burn), fishing and the utilisation of wood and NTFPs (from mangroves and lowland forests). All subsistance activities and livelihoods require thorough assessments to determine their sustainability and climate resilience. This will entail, but not be limited to, the following: i) assessing current and potential alternative livelihood options; ii) determining the most cost-effective and efficient agricultural practices for increasing productivity and food security; iii) increasing intensification (rather than extension) of agricultural lands; and iv) determining whether incentives towards such shifts can be obtained through the carbon market (i.e. REDD+).

Land use planning and zoning will be more credible if they are backed by effective and enforceable legal instruments. In the absence of effective law enforcement the land use plans run the risk of remaining as paper plans, rather than implemented plans. This problem is likely to decrease in the longer term as communities adjust to the constraints and become voluntarily compliant.

1.2. **Promote alternatives to the practice of slash and burn farming (improved agricultural and management)**

The productive capacity (nutrient status) of soils throughout Nigeria is generally poor[[194]](#footnote-194). The rural population consequently largely depends on slash and burn agriculture, whereby land is cleared by felling and burning of trees and brush cover. This process increases the nutrient levels in soils for a short period of time (two to three years), after which the soils are exhausted and new sections of forest must be cleared for cultivation. In the process, new tracts of land are opened, leading to further deforestation. Remedial measures to reduce slash and burn agriculture would therefore entail addressing the root cause, which is the shortage of nutrients. The nutrient status of poor soils can be enhanced through different means, including *inter alia*: i) atmospheric nitrogen fixing (with the use of leguminous plants) or ii) the use of organic or inorganic fertilizers. In this respect, the Ministry of Agriculture recognises the need to advise the farmers on how much fertilizer (organic or inorganic) they need to apply. In addition, techniques such as agroforestry[[195]](#footnote-195) or conservation farming that can improve agricultural productivity may reduce the need for slash and burn methodologies. These will require investigation and piloting in order to determine the most appropriate and socially acceptable techniques for Delta State.

The international carbon offset market is a valuable mechanism for funding and promoting improved agricultural management. Methodologies exist both in the formal CDM and the informal voluntary carbon market for the securing of carbon offsets for changing agricultural practices (minimum tillage, low carbon and reduced methane emission methodologies, for example). Slash and burn agriculture is a particularly high impact farming practice in terms of carbon emissions, and transformation to productive sedentary agriculture provides the potential for earnings through specified methodologies for improved farming practices. These earnings could be channelled into the provision of suitable infrastructure and resources to support rural farmers, ensuring the success of such projects. Education of local communities and the provision of effective agricultural extension services to ensure suitable agricultural practices are utilised is essential.

Suggested activities include:

* investigation of appropriate carbon offset methodologies to provide finance for improved agricultural management practices;
* identification of procedures to improve soil fertility and increase productivity of small scale agriculture;
* training of agricultural extension officers to provide education and enhance the skill sets of local communities; and
* coordination with local administrative structures to facilitate community buy-in and benefit distribution.

1.3. **Developing and promoting appropriate agricultural research**

It is essential that the potential impacts of climate change on agriculture in Delta State through time are modelled and examined. Changing climatic conditions may reduce productivity even under new agricultural methods, requiring an expansion of agricultural land in order to maintain food security. A good example of agricultural impacts of climate change is cassava (*Manihot esculenta Cranz*.). This plant is a staple of the Nigerian diet, with Delta State production having increased from 795,000 t to 902,000 t over the period 1999-2002[[196]](#footnote-196). One of the complications of cassava farming is that the plant has high levels of cyanogenic glucosides (chemicals that break down to produce cyanide, a metabolic poison). Whilst the levels are generally low in the tubers, they are above the recommended WHO levels of 10 ppm (levels of 20-40 ppm are regularly detected in cassava flour, and levels of up to 200 ppm in drought years have been measured[[197]](#footnote-197)). The leaves are often eaten by producers as a relish (though they are not frequently sold in markets), and typically have higher cyanogenic glucoside concentrations (~586 ppm). Increased CO2 levels have been shown to increase the cyanogenicity of the leaves (up to 1544 ppm at twice ambient CO2 levels[[198]](#footnote-198)). Increased CO2 has also been shown to decrease the size of tubers significantly, irrespective of climatic conditions, which implies that cassava crop sizes may decrease significantly over the course of this century. The potential impacts of climate change on this staple crop highlight the importance of breeding resistant varieties with reduced cyanogenic properties and increased resilience to climate change.

The government of Delta State should liaise with universities and relevant research institutes such as the Internal Institute of Tropical Agriculture (IITA)[[199]](#footnote-199) to carry out appropriate agricultural research to climate-proof food productio. This will promote the planting and management of appropriate crops and planting regimes to cope with current and future climate scenarios within Delta State. This may require constructing a research centre equipped with suitable laboratories such as a soil-crop laboratory. Some indicative activities of the research centre are:

* Putting in place an Early Warning System (EWS) to enhance the capacity of the state to predict and cope with poor growing conditions.
* Conducting a soil survey within the state to assess the suitability for different crops.
* Developing suitable agricultural machinery such as planting machines.
* Research on flood tolerant and saline resistant crop varieties.
* Investigate the responses of common staples to changing climate conditions, and identify and promote the growth of resilient species and varieties.

1.4. **Promoting conservation through cultivation for non-timber (non-wood) forest products (NTFPs or NWFPs)**

NTFPs play an important role in addressing poverty issues for marginalised, forest-dependent communities. The over-exploitation and eventual disappearance of NTFPs are of both local and global concern, because when a plant or animal species goes locally extinct: i) it can no longer contribute to the diet or economy of forest communities; and ii) it increases the risk of irreplaceable loss of species and genetic biodiversity that would otherwise significantly contribute to forest ecosystem production and resilience. The major challenge for the sustainable use of NTFPs is how to reconcile biodiversity conservation with an improvement in community livelihoods. The holistic management of NTFPs provides a means of contributing to sustainable development and conserving forests and biodiversity through the promotion of non-traditional enterprises.

One way to achieve this is by developing and implementing a “conservation through cultivation” programme. Such a programme will help conserve wild and threatened economic forest species by reducing harvesting pressures through the provision of cultivated material. This can be achieved by implementing a structured research programme aimed at developing cheap and efficient domestication and cultivation methods for the target species. Fortunately, there are several NTFP species currently used in Nigeria[[200]](#footnote-200).

The aims of the programme should include (but are not limited to) the following[[201]](#footnote-201):

* Developing and promoting cost-effective and science-based methods for germplasm collection.
* Developing simple and effective methods for large-scale propagation.
* Developing and promoting cost-effective and transferable cultivation methods.
* Establishing appropriate means of dissemination that can enable the local communities to adopt the techniques.

Key steps in the programme include:

* preliminary study (literature review);
* field germplasm collection;
* germination and propagation trials of suitable NTFPs;
* distribution and planting of seedlings;
* dissemination and publication of results and lessons learned; and
* extension work.

The first step in any NTFP programme is to determine what the people use and its relative importance in the domestic and market economy. A market chain analysis and market research would need to be conducted in order to determine: i) the suitability to Delta State; ii) the start-up capital required to initiate such a market; and iii) the government support required to establish a market.

The selection of target taxa should therefore be based on following socio-economic, ecological and policy criteria:

* the NTFP must be indigenous and must be highly valued for domestic consumption or as a product for the market;
* the demand for the “high valued” NTFP should exceed the supply;
* the NTFP must be presently harvested from the wild and must be considered threatened by excessive harvesting;
* the cultivation of the NTFP is recommended by relevant policy documents; and
* the cultivation of the NTFP may be requested by potential collaborating partner institutions.

Some good examples are *Gnetum africanum* and *G. buchholzianum*, (locally known as *ukasi* in Igbo and *afang* in Efik/Ibiobio), and *Irvingia gabonensi* (known as *ogbono/ube* in Igbo, *oro mopa* in Yoruba and *mamujigoro* in Hausa). The leaves of *Gnetum* are highly valued as nutritious green vegetables across Central Africa and most of West Africa, particularly Nigeria. In Nigeria the leaf of *G. africanum* is also used in the treatment of an enlarged spleen, sore throats and as a therapeutic[[202]](#footnote-202) and the species is scarce in the wild[[203]](#footnote-203). The seed of *I. gabonensi* is widely used in Nigeria for soup and the species is considered as endangered[[204]](#footnote-204).*Gnetum* is an evergreen climber (liana) that thrives in a wide range of habitats including farm fallows, secondary and primary forests, using a host of supporting plant material (dead and alive) in their natural habitat to grow and produce large quantities of leaf biomass. Under wild conditions *Gnetum* grows and forms underground tubers, which can remain alive for several years even after the above ground biomass is gone*. Gnetum* can be propagated vegetatively by rooting leafy vine cuttings.

1.5. **Develop and promote storage and processing technologies to reduce post-harvest food loss**

It is estimated that at least 10% of Africa’s crop productivity is lost on and off farm, which can lead to food insecurity and impact negatively on the livelihoods of the population[[205]](#footnote-205). This is mainly because most subsistence farming communities do not have access to appropriate post-harvest storage and processing technologies. Furthermore many of the existing technologies are not accessible to and adapted by local communities in African countries. Post-harvest losses are also exacerbated by climatic conditions such as floods, heavy rains, droughts and pest and diseases.

Tropical root and tuber crops such as cassava, sweet potato, yam and cocoyam are important household food security and income generating crops in many African countries, Nigeria included. The people of Nigeria and Delta State (many of whom are very poor) depend on these crops for food, livestock fodder and income. Cassava, for example, can considerably transform local economies. It has the potential to be used in processed forms for food, livestock fodder and starch-derived products. However, cassava and other root and tuber crops are perishable and therefore need processing to increase shelf-life.

Most of the existing technologies for processing root and tuber crops do not exploit the full potential of these crops as sources of food, livestock fodder and income. Developing and promoting new and appropriate storage and processing technologies that can render these crops less perishable and increase their nutritional and economic value offers potential to improve food security and local industrialization. Examples of such technologies include

* solar drying;
* flash drying;
* use of metal silos;
* use of three-layer hermetic bags to increase storage time; and
* pest control chemicals.

In the light of the above, it is proposed that Delta State government undertake the following steps to develop and promote appropriate technologies to reduce post-harvest crop loss:

* Carry out an inventory of existing technologies and practices employed (within the state and regionally) to reduce post-harvest crop loss.
* Promote information exchange between communities and experts on appropriate technologies.
* Encourage new research and technological innovation.
* Put in place a multidisciplinary team of researchers and technicians to work on specific food technology development initiatives.

**Water**

2.1. **Rainwater harvesting**

Increasing variation in rainfall patterns is highly problematic in terms of both agriculture and health. A simple but effective means of increasing stability of the water supply is the implementation of a large scale rainwater harvesting programme. RWH can operate at several scales, each of which has been successfully implemented in various places in the world.

Large scale RWH includes construction of flow-limiting structures to increase ground penetration by large rainfall events and increase groundwater recharge. Construction of recharge pits or “injection wells” can further increase the recharge potential of this activity by trapping runoff locally. In addition, construction of small dams and storage reservoirs can be undertaken at minimal cost by local communities, increasing the long-term water availability to communities. Such large scale schemes have been successfully implemented in China, and are being investigated for use in Gurgaon[[206]](#footnote-206), India. In years of high rainfall, such large-scale RWH measures can reduce the quantity of water reaching rivers, minimizing the potential for flood damage.

Building-level RWH is the more conventional implementation, and entails the construction of storage reservoirs for individual houses within the project area. Capture of runoff from the roof of a building during heavy rains can provide meet most of a households water needs, reducing the necessary investment in reticulation and water purification. Additionally, in years of low rainfall, harvested water provides some resilience to shortages for vulnerable households. This has been implemented in China and India for hundreds of years, and is a viable bottom-up method of water management[[207]](#footnote-207).

Suggested activities include:

* investigation of a comprehensive RWH management plan for Delta State;
* education of local communities in the benefits of rainwater harvesting, and training in the construction of low-cost options (such as dykes to reduce water flow rates and increase groundwater recharge);
* provision of storage tanks and guttering in areas with sufficient roof area to justify household water harvesting;
* use of sealed storage reservoirs and pipes to reduce water loss through evaporation; and
* construction of small dams and ponds in hilly areas to increase water storage infrastructure.

2.2. **“Air to water” projects**

Atmospheric harvesting of water provides a potential source of water even in areas where groundwater salinisation may occur through SLR. “Air to water” plants chill air to below the dewpoint in order to extract water vapour as liquid water. A caveat of this technology is that it requires significant energy resources (typically in the order of 0.5 kWh per litre[[208]](#footnote-208)) for implementation. This makes this an expensive technology, and it may not be viable in areas that have poor electricity supply and low generating capacity. Atmospheric harvesting plants cannot generally be operated on a reasonable scale except with investment from government, but provide real potential for maintaining resilience in drought-impacted areas and areas in which no alternative water source can be sourced.

Delta State Oil Producing Areas Development Commission (DESOPADEC) undertook an “Air to Water” project in Okerenkoko in 2008, costing over $1,3 million. At its peak, this operation was generating over 30,000 litres of water per day, and was the only source of potable water for the local communities. The equipment was damaged by a military operation in 2009, but nevertheless shows the potential of this technology. It is of particular relevance to areas with reduced rainfall, or where groundwater potability is threatened by increasing salinity from SLR.

Suggested activities:

* evaluation of the effectiveness and financial viability of the Okerenko DESOPADEC “Air to Water” project;
* identification of vulnerable areas within Delta State for which no alternative water source can be located; and
* investigation of the potential for additional atmospheric harvesting plants if financially viable;

2.3. **Build on/invest in solar water pumps in order to reduce the use of generators.**

In areas with infrequent access to water, or that are not located close to streams, obtaining water can take up a significant amount of time. Access to groundwater from wells is often essential for sanitation, household consumption and crop production. Where these wells are deep, or the required water extraction rate is high, pumping is often required. Solar water pumps provide a low-maintenance method of extracting groundwater for communal usage, without resorting to the use of generators or grid electricity, and have been rolled out in Ghana by the Always On Solar Project[[209]](#footnote-209) (AOSP), and in Thailand by the GEF Small Grants Project[[210]](#footnote-210). This water is stored in tanks or cisterns, ensuring a regular supply of water even when there is a reduction in the volume of water pumped due to overcast conditions. Communities with access to this technology need to devote less time to water procurement, and it has advantages over wind pumps because of the reduced maintenance cost (wind pump maintenance costs are estimated to be as high as $1,200 per well per year). Importantly, use of solar water pumps reducesCO2 emissions by as much as 384 kg per month, and sale of these offsets on either the voluntary carbon market or through the CDM provides a potential funding stream for facilitating the rollout of solar pumps.

The TACC programme will implement several pilot solar power projects, and the lessons learned from these should be integrated into the feasibility assessment for this activity.

Suggested activities include:

* investigation of potential earnings from solar power on the carbon offset market;
* costing and piloting of solar water pump projects in vulnerable communities;
* assessment of project success before scaling up to meet widescale demand.

2.4. **Improved water monitoring**

Water monitoring in rivers comprises two major elements: water quality monitoring and flow rate monitoring. Water quality monitoring allows for quick identification of pollution events, detection of potential health issues and rapid response for addressing potential outbreaks of waterborne disease. It also provides an invaluable source of information for evaluation of the effectiveness of resource management measures. The Global Environment Monitoring Programme (GEMS/Water)[[211]](#footnote-211) is a programme run by UNEP which facilitates the implementation of water quality monitoring programmes, and internationally many water quality monitoring programmes provide valuable information for ensuring the health of local communities.

Flow monitoring in major rivers provides a planning and early warning system for the country. Increased flow upstream from storm surges or downstream from flooding events can be detected quickly, and with the appropriate early warning systems in place people can be warned in a timely manner (and evacuated if necessary). In addition, long term flow monitoring provides a measure of the effectiveness of watershed management and protection procedures, an estimate of the effect of climate change, and a planning tool for targeting areas that are likely to need assistance when river flow drops.

Suggested activities include:

* investigation of potential for establishment of permanent flow monitoring stations in major rivers, both upstream and downstream;
* establishment of EWS send out flood warnings to vulnerable communities;
* training of technicians and purchase of water quality monitoring equipment.

2.5 **Watershed protection**

Watershed protection projects have been undertaken in many areas where river flow is reduced, such as the successful watershed protection programme carried out in many states in the USA[[212]](#footnote-212). Successful programmes reduce erosion and the sediment load of river, increase river flow and groundwater recharge, and improve water quality. Watershed protection also minimises the chances of flooding. Large-scale buy-in from local communities is required for such a programme, since it must operate over large areas. Consequently, a principal component of watershed protection is education of communities in the values of retaining ground cover vegetation and the dangers of streambank cultivation. Suggested activities include:

* education of local communities;
* promotion of intensive vegetation cover planting to reduce evaporation and erosion;
* assessing the use of creative vetiver applications;
* installation of contour buffer strips;
* natural vegetation strips (NVS);
* double rowing of Nitrogen-Fixing-Trees (NFTs);
* Land use de-intensification and diversification;
* stabilisation of streambanks; and
* provision of technical expertise.

2.6. **Develop early warning systems for communities in areas highly vulnerable to flooding.**

The Ministry of Environment of the Federal Republic of Nigeria, in collaboration with numerous other partner agencies, has set up an internet based Flood Early Warning System (FEWS) to monitor various locations in the country for flood signs, and issue alerts to minimize loss of lives and property[[213]](#footnote-213). The FEWS is setup to cater for river basins and reservoirs/dams in urban areas. Forecast data, including rainfall, temperature, humidity and atmospheric pressure are provided for various cities in the country.

The FEWS should be expanded to include rural areas. Rural communities generally cannot access the internet therefore the system is not effective in the regions often most hard-hit by flooding. Suggested activities include:

* an expansion of the FEWS to include the monitoring of river basins and dams affecting rural areas in times of flood;
* research into the most effective way to communicate the warnings to rural communities;
* development of action plans to advise rural communities on the correct course of action once an alert has been issued; and
* education of rural communities so that the full benefits of the expanded FEWS are realised.

**Ecosystem function**

Ecosystem-based adaptation can greatly reduce the vulnerability of local communities to climate change by increasing the supply of ecosystem goods and services. Such goods and services include fish supplies, fruit and meat, fiber, timber and water. By restoring degraded ecosystems, the livelihoods of local communities can be greatly improved. The international carbon market presents a large opportunity for funding of large-scale ecosystem restoration. The proposed project could play an important role in building capacity to access carbon markets for ecosystem-based adaptation. It could also assist Delta State in developing bankable project documents to initiate activities on the ground. It is proposed that workshops are run at a regional level to train appropriate technicians in government and the private sector (particularly those involved in departments of forestry and/or the environment) in the development of project documents to access both the CDM market and the voluntary carbon market (through for example the Voluntary Carbon Standard).

**Potential workshop activities**

Workshop topics would include *inter alia*:

* Carbon market overview (e.g. CDM, REDD+, LULUCF, VCS)
* The concept of ecosystem-based adaptation
* Identification of eligible projects
* The processes to access carbon credits
* Project document development
* Baselines
* Additionality
* *Ex ante* and *ex post* calculations
* Socio-economic and biophysical data requirements
* Institutional arrangements
* Seed funding requirements

**Potential outcomes**

Technicians in government and the private sector will be provided with the skills to develop project documents that can tap into the multi-billion dollar carbon market, thereby enabling considerable upscaling of ecosystem-based adaptation. Additionally, potential projects would be identified, with the view to develop bankable project documents during 2011. Possible projects could include:

3.1. **Mangrove and wetland restoration**

Some 10% of the Niger Delta is covered with mangroves, much falling within the limits of Delta State[[214]](#footnote-214). Mangroves are relatively resilient ecosystems, and are a vital source of resources for rural coastal communities; an estimated 20 million people in West Africa depend on its biodiversity for their livelihoods. By some estimates, over 60% of the fish caught in the seas of West Africa breed in the mangroves of the Niger Delta[[215]](#footnote-215), making this an essential resource for the region. Early calls for conservation of the ecosystem[[216]](#footnote-216) were ignored, with oil spills and clearance for charcoal manufacture accounting for large losses in mangrove extent and condition over the last 50 years. The National Oil Spill Detection and Response Agency (NOSDRA) had identified approximately 2,000 sites requiring remediation by 2008, and the Niger Delta Natural Resource Damage Assessment and Restoration Project (NRDARP) undertaken in 2006 identified many ecosystems in need of restoration as a result of oil spills[[217]](#footnote-217).

Coastal and inland wetlands cover about 3% ofNigeria's land surface. These wetlands are of ecological, economic, socio-cultural, scientific and recreational significance, and play an important role maintaining stream flow in times of drought and mitigating flood flow in times of high rainfall. In addition, coastal wetlands (that are not degraded), much like mangroves, buffer inland areas against SLR. Nevertheless, Nigeria's wetland resources are currently being threatened by certain anthropogenic and biogeophysical factors. Notable among such factors are population pressure, rapid rate of urbanization, mining, oil and industrial waste pollution, uncontrolled tilling for crop production, over-grazing, logging, unprecedented land reclamation, construction of dams, transportation routes and other physical infrastructure, marine and coastal erosion, subsidence, ocean water intrusion, invasion by alien floral and faunal species, sand storm, desertification, and droughts[[218]](#footnote-218).

**Wetlands**

Restoration of mangroves is essential not only because it represents an important biodiversity pool and economic resource, but also because mangroves play a vital role in protecting coastal regions from increasing impacts of SLR. Mangroves can buffer against the effects of serious storm surges and secure the coast against erosion, but will require additional inland area in which to migrate in order to perform this function as the sea level rises. This means that planting efforts will have to focus not only on maintaining the current extent of the mangroves, but identifying areas suitable to facilitate their migration.

Some restoration projects piloted by oil companies are currently underway[[219]](#footnote-219),[[220]](#footnote-220), although the efficacy of these restoration efforts has not been established. Global best practice methods have been developed for the restoration of mangroves, which could be applied, such as the Mangrove Action Project (MAP)’s Ecological Mangrove Restoration Method[[221]](#footnote-221). This method has been successfully applied in Indonesia to restore tsunami-damaged mangroves, and involves direct community participation and education.

The NRDARP identified potential restoration models to be followed, and made a series of socio-economic, environmental and public awareness recommendations that provide a set of guidelines for undertaking restoration of the mangroves. Notable amongst these recommendations is the principle holding oil companies responsible for restoration of areas that can be identified as having been damaged by their actions, which could provide a framework for obtaining funding for restoration. Additionally, the recent roll out of REDD+ methodologies by the CDM provides a framework under which Nigeria could potentially secure carbon offset finance for successful damage-prevention and restoration schemes in mangrove areas.

Suggested actions include:

* investigation of appropriate REDD+ methodologies for mangrove restoration;
* identification and classification of wetlands across the State to facilitate the rejuvenation of carbon sink capacities of specialised bogs and peat lands;
* delineation of wetland conservation banks for enhanced contribution to the global carbon de-capitalisation scheme in the State;
* investigation into the extent of the country-wide wetland degradation;
* investigation of incentive and punitive schemes to ensure the engagement of oil companies in restoration operations;
* assessment of the success of current restoration operations, and expansion of viable methods to additional areas;
* education of local communities about the value of mangroves and wetlands; and
* engagement of communities in restoration operations through planting, seed gathering, and other means, to ensure communities support restoration and conservation operations.

3.2. **Improved forest management and forest restoration**

In 2005, Nigeria was identified to have the highest rate of deforestation in the world (losing 53% of its primary forests over the period 1990 – 2000, and a further 26% by 2005)[[222]](#footnote-222), and is listed in a worldwide assessment as having the third largest average annual net forest loss (-3.7 %) over the period 2000 - 2010[[223]](#footnote-223). The loss of such significant areas of forest indicates that consumption is significantly above sustainable levels. As well as releasing large quantities of CO2 into the atmosphere deforestation has significant negative short- and long-term environmental effects. These effects include increased erosion, deterioration of water quality, siltation of rivers, and a reduction in forest resources available to rural communities. Furthermore, loss of forest is likely to exacerbate the impacts of climate change by reducing localised convectional rainfall. Restoration and maintenance of lowland tropical forests and degraded coastal forest can also reduce flood impacts, and conserve topsoils.

REDD+ methodologies under the CDM and in voluntary carbon markets present an opportunity to reduce the loss of forests through carbon offset financing. Considerable international funding is available at present to promote the development of REDD projects, and whilst most projects are still in the early stages, there are a large number being rolled out in such varied places as Peru[[224]](#footnote-224), Indonesia[[225]](#footnote-225) and Tanzania[[226]](#footnote-226), as well as Cross River State in Nigeria[[227]](#footnote-227). In addition, afforestation, reforestation and restoration (ARR) methodologies under the same schemes can provide additional funding to promote restoration of indigenous forests (e.g. a Tanzanian grassland tree planting programme has just begun to earn credits under the Voluntary Carbon Standard (VCS)[[228]](#footnote-228)). For these programmes to work there must be significant community participation, particularly in the case of REDD+. This means that a significant portion of the carbon earnings must devolve to the communities, or be used in the promotion of alternative livelihoods that both improve the wellbeing of the communities and incentivise forest protection. Restoration and improved forest management structures therefore require extensive stakeholder engagement on all levels, and the identification of appropriate local and national management structures and benefit distribution systems. Such systems present a clear benefit at all levels, but the implementation is multidisciplinary and thus complex and needs careful planning.

There is a strong overlap between improved forest management and improved agricultural management objectives: reduction in agricultural land expansion and increasing agricultural productivity will result in a reduction in forest loss.

Suggested activities include:

* exchange of knowledge with international partners with experience in REDD and ARR project implementation;
* identification of public and private sector organisations for project implementation;
* identification of suitable areas for restoration activities; and
* engagement with local communities to identify suitable alternative livelihood options and highlight the importance of forest conservation.

**Health**

4.1. **Build on programmes to build ventilated pit latrines.**

Pit latrines are simple constructions that can significantly improve water quality, improve hygiene and reduce outbreaks of waterborne diseases in areas that have no sewage reticulation and poor water supplies. This has been demonstrated through many projects implemented in sub-Saharan Africa such as Zimbabwe, where more than 500,000 VIPs were built over the period 1975 - 2000[[229]](#footnote-229). The costs of building Ventilated Improved Pit Latrines (VIPs) from brick are relatively high, but lower cost options have been pioneered. Significantly, in the Amhara region of Ethiopia, a community education programme highlighting the importance of proper sanitation was undertaken by the Carter Foundation, and as many as half of the households constructed their own pit latrines at virtually no cost[[230]](#footnote-230). For those who paid anything for construction the median cost was US$2.80, and some 89,000 were constructed in a single year. The potential impacts of such an education programme on water quality and long-term health cannot be overstated.

Suggested activities include:

* a state-wide education campaign highlighting the importance of sanitation and training people in the construction of VIPs;
* subsidising of building materials for household VIP construction.

4.2. **Roll out of mosquito nets**

Nigeria already has a heavy burden of vector-borne diseases such trypanosomiasis and malaria. Under changing climatic conditions it is expected that the ranges of these diseases could shift, affecting significantly more people. For example, the increase in stagnant pools as a result of increased flooding incidence and rising sea levels is likely to increase the breeding habitat for mosquitoes. New evidence regarding micro-climate change as a result of changing land use indicates that swamp reclamation and deforestation can cause spread of malaria to new areas.[[231]](#footnote-231)

Mosquito nets have been identified as one of the most effective means of preventing malaria, and the provision of mosquito nets on a large scale has had significant effects in reducing deaths. Programmes building on this have been implemented across Africa, with UNICEF distributing almost 3 million nets in Mocambique alone between 2000 and 2009[[232]](#footnote-232). Nigeria has received large donations of mosquito nets as well, but expansion of this operation could have significant benefits health in for Delta State. Education on the importance of usage is also essential, since studies show that some households that possess nets do not regularly use them[[233]](#footnote-233).

Suggested activities:

* education of communities about the importance of mosquito net usage; and
* roll out mosquito nets to poor communities who are unable to purchase their own nets.

4.3. **Intensify vaccination campaigns**

Climate change is likely to result in the spread of disease due to the adverse living conditions expected as a result of, principally for Delta State, an increase in flooding due to intense rainfall events, and a rise in sea level inundating portions of the Niger Delta. These factors will result in the displacement of communities, pollution of domestic water sources (sedimentation and salt intrusion) and malnourishment due to failed crops. Community migrations are expected, leading to a proliferation of infectious diseases.

Nigeria has undertaken wide-spread vaccination campaigns, including issuing vaccinations against polio (2010), meningitis (2009) and measles (2008). The effectiveness of these operations and the need for others should be investigated. Suggested activities include:

* research the effectiveness of vaccination campaigns to date;
* determine key focus areas in most need of vaccinations; and
* educate the community on the importance of vaccinations.

**Energy**

5.1. **Methane harvesting from landfills**

Nigeria is a Methane-to-Market member country, and according to US Environmental Protection Agency’s (EPA) Global Anthropogenic Emissions of non-CO2 GHGs report, Nigeria's estimated anthropogenic methane emissions ranked ninth in the world[[234]](#footnote-234). About 2.23 million metric tons of carbon equivalent of world methane emission are generated in Nigeria’s landfill sites. Hence, Nigeria is a major contributor to the global methane emission[[235]](#footnote-235).

Landfills provide ideal conditions for methanogenesis (the creation of methane gas) due to the high organic material content and anaerobic conditions. Buried waste means that methane can be produced for many years after a landfill site is closed, due to the waste slowly decaying underground. In recent years, landfill methane emission has been identified by several world governments as a GHG source which can be both easily defined and reduced. Aside from the practice of covering landfills with a thick soil layer, to promote methane uptake by soil methanotrophs, more proactive strategies are also available. Methane recovery systems are now commonly installed at landfill sites and these can reduce emissions to the atmosphere by more than half. Sometimes the recovered methane is flared off, producing the less powerful greenhouse gas, carbon dioxide. However, these methane recovery systems can also provide an economically viable energy source, with the collected methane being used in electricity generation or sold from verified projects on the carbon market. There are three main options for utilization of methane from landfills, namely, direct use in a kiln or boiler, use for electricity generation and upgrading of the gas to pipeline supply quality. The generation of on-site electricity is the most simple use of the generated methane.

Due to the relatively high methane emissions from landfills, there is a great deal of potential to capture the emissions and transform them into energy and revenue. In order to achieve this, it will be essential to develop a comprehensive project for Delta State.Suggested activities include:

* identify of suitable landfills;
* establish an effective waste collection practice;
* determine an accurate estimate of the methane that can be generated from the identified landfills;
* investigate adequate methane recovery systems;
* investigate appropriate methane utilization systems that will co-generate electricity and process heat; and
* establish the value of the captured methane on the carbon market, and investigate the options of registering methane-capture projects.

5.2. **Roll out a CFC light bulb installment programme to put bulbs into all government buildings.**

Energy security will play a vital role in ensuring that Delta State can meet its economic and social development objectives, and that it remains an attractive destination for investment. **Compact Fluorescent Light bulbs (**CFLs) can significantly reduce energy use and cost less to run than ordinary incandescent globes – an incandescent globe which generally draws 60 watts is equivalent to a CFL which only draws 11 watts, and while an ordinary light globe provides approximately one thousand hours of light, a CFL will give approximately six thousand hours of the equivalent amount of light.

In 2005 the city of Cape Town, South Africa experienced severe electricity shortages due to infrastructure-related problems. Local authorities launched a pilot project with the national electricity distributor whereby staff exchanged their domestic incandescent light bulbs for new energy-saving CFLs. In addition, the local authorities commissioned the retrofitting of its buildings with CFLs as well as more efficient heating and cooling systems and appliances. Renewable energy technologies such as solar photovoltaic and solar thermal interventions were also investigated. The project proved to be very successful and a city-wide light bulb exchange programme was subsequently implemented, contributing to poverty alleviation, infrastructure development, energy conservation and climate change, energy security and energy investment.

Delta State could embark on a similar roll out. Suggested activities include:

* educate government officials about the benefits of CFLs;
* launch a campaign whereby government officials exchange ordinary light bulbs for CFLs;
* change all government buildings light bulbs to CFLs; and
* expand the project to the rest of Delta State.

5.3. **Utilise gas emitted from the oil industry (as an alternative to flaring).**

Oil companies in Nigeria routinely flare as much as 75% of the gas produced as a by-product of petroleum extraction[[236]](#footnote-236), resulting in a considerable loss of energy and significant CO2 emissions. Gas flaring also creates large amounts of pollution in the form of benzene and other toxic substances which are associated with leukemia and respiratory diseases. Although regular flaring is illegal, the gradual flare-out policy has yet to be fully implemented.

Capture of gas is an essential component of mitigation, and can provide a significant source of energy for the growth of the Nigerian economy. The Gaia Project is expanding the market for oil gas in Nigeria through its CleanCook stoves project[[237]](#footnote-237), which burn methanol. Delta State government is working together with HydroChem of Linde AG to develop a natural-gas-to-methanol plant. Furthermore, three of the four registered CDM projects in Nigeria involve the capture of natural gas from refineries or oil fields[[238]](#footnote-238), and the focus of the Nigerian government on gas-to-power policy[[239]](#footnote-239)[4] highlight the importance of reducing gas wastage through flaring.

Suggested activities include:

* investigation of the effects of increasing fines and legislative restrictions on the reduction of flaring activity;
* facilitation of expanded current natural gas capture activities; and
* a cost-benefit analysis of the economic effects of a state gas-to-power scheme.

5.4. **Develop alternative energy sources (e.g. biogas, solar) and introduce fuel-efficient stoves in rural communities and/or decentralize off-grid systems using renewable energies.**

The reduction in energy consumption and use of natural resources is a vital component of mitigating the impacts of climate change. In Nigeria alone, it is estimated that 20 million families cook with bio-fuels (wood and charcoal) that are derived principally from non-renewable biomass resources. Methanol, alternative fuel and efficient wood fuel stoves offer improvements in air quality, energy efficiency, household health, GHG emissions and quality of life issues. Project Gaia is a project for the commercialization of a new methanol stove and fuel system in Delta State, with future plans to harness methanol from gas flaring and provide a supply of cheap and readily available fuel[[240]](#footnote-240). The project seeks to use Nigeria as a demonstration country for the introduction of an appropriate methanol stove/small scale methanol plant technology and for the development of a market for the new stove and fuel. In addition to the Gaia project, the ‘Efficient wood fuel stoves for Nigeria’ project targeting 12,500 households in the Guinea Savannah (central) Zone in Nigeria was registered as a CDM small-scale project in October 2009. In order to build on these and other programmes, suggested activities include:

* an investigation into the number of alternative energy source project in Delta State;
* encouragement of new such projects;
* support of existing projects and initiatives; and
* a review of the policies governing alternative energy sources in order assist emerging projects.

5.5. **Develop green building codes and energy demand side management.**

The Nigerian Electricity Regulatory Commission[[241]](#footnote-241) is developing a framework for energy efficiency and demand side management. The Energy Commission of Nigeria is also involved in promoting energy demand side management through strategic planning at the national level[[242]](#footnote-242). Energy efficiency in Nigeria could be promoted in terms of *inter alia* i) encouraging use of public transport to reduce emissions from private vehicles; ii) using energy efficient lightbulbs[[243]](#footnote-243) ii) raising awareness through campaigns to educate people on energy wastage. The Nairobi Declaration on Green Building in Africa is an initiative that emerged from a conference around green building rating in Africa, initiated by the United Nations Human Settlements Program[[244]](#footnote-244). Subsequent to this conference, the Nigerian Green Building Council was officially recognised by the World Green Building Council.

Specific measures of the World Green Building Council that could be promoted through the Green Building Council include:

* reduction of energy and resource use through the use of energy efficient air conditioning and lighting;
* waste reduction;
* use of recyclable materials;
* water efficient plumbing fittings, and
* water harvesting.

A potential project could aim to build on these baseline initiatives.

# ANNEX 4. Indicative Table of Contents of an Integrated Territorial Climate Plan

*Source: UNDP’s primer on Integrating Climate Change Planning for Regional Governments (UNDP, 2009. Charting a New Low-Carbon Route to Development: A Primer on Integrated Climate Change Planning for Regional Governments).*

Introduction (objectives of the ITCP, process followed and methodologies adopted)

**Part A: Climate Profile**

*1. Description of the regional context*

* 1. General economic and demographic data on which analyses and scenarios will be built
	2. Regional development issues and priorities
	3. Identification of main local stakeholders
	4. Past and on-going climate change and related risk management actions

*2. Vulnerability Assessment*

* 1. Assessment of existing climate and socio-economic vulnerabilities
	2. Projection of possible climate changes at relevant spatial and temporal scales
	3. Simulation of the physical and economic impacts in the most vulnerable sectors (agriculture, water, coastal zone management, health, tourism, etc.)
	4. Assessment of impacts on most vulnerable groups

*3. GHG emissions and energy needs*

* 1. Assessment of existing GHG emissions by sector(transport, buildings, industry, waste, agriculture and forest) and sub-sector and energy demand/supply
	2. Assessment of energy needs by 2020/2050 and expected GHG emissions by 2020/2050 under a business as usual scenario

**Part B: Identification and selection of priority options**

1. List of selection criteria adopted and key sectors identified for low emission development and adaptation policies and measures
2. Description of main opportunities identified in each sector
3. Estimated costs and benefits (environmental, social and economic: GHG emission reductio~~n~~s, job creations, energy access, local pollution reductions) of the different options and comparison of these options
4. Assessment of adaptive capacity and feasibility of implementing the options.
5. Description of potential synergies and trade off identified between priority adaptation and mitigation measures
6. List of prioritized mitigation and adaptation options (no regrets/low regrets, negative costs, no cost, low cost, higher cost options; short term, middle term, long term, political and social acceptance, regulatory needs, capacity and financial requirements, irreversibility)

**Part C: Integrated Climate Change Action Plan**

1. Review of existing climate change policy/financial instruments and institutional implementation arrangements
2. Survey of public opinion, including business community (optional)
3. For each priority option, description of matching policy/financing instruments to attract and drive direct investment towards lower carbon/climate resilient activities
4. Detailed first portfolio of no-regret actions identified at early stages of the process and already under implementation by the time the IRCCAP is finalized.
5. List of projects adopted (public policies and investments) and integrated policy and investment action plan
6. Implementation and M&E Arrangements (governance, indicators, etc.)

**Annexes:**

Present and Future Vulnerability Maps

List of proposals from co-construction process, public forums, and white papers.

Project Summaries listed by size and types of financing

# ANNEX 5. Potential Funding Mechanisms for Adaptation and Mitigation Schemes

**Potential financing options, instruments and mechanisms for Delta State**

* Directing investment flows to create new markets such as carbon credits and Payments for Ecosystem Services.
* Public investment plans.
* Private funding (i.e. Green Equity Finance, Non-Governmental Organisations).
* Public-private partnerships (PPP).
* Multilateral funds.
* Promoting investments in the construction of long-lived infrastructure that take climate change into account (e.g. by using building regulations and performance standards).
* Using fiscal incentives (e.g. tax relief) to promote the use of climate change adaptation measures.
* Creating incentives for alternative livelihoods by reducing taxation and/or providing subsidies (e.g. for the use of climate-resilient crops).
* Community-based insurance schemes against crop failure (e.g. flood and/or weather index insurance schemes).
* Tax incentives or subsidies for farmers using local climate change adaptation technologies; and differentiated and progressive water tariffs.
* Access funding from the Ecological Fund of Nigeria (new guidelines were finalized in 2009 for the disbursements of funding).
* Access funding from the Adaptation Fund (see below).

**Examples of innovative financing mechanisms[[245]](#footnote-245)**

1. *Farmer cooperatives (Mexico)*

A group of farmers in the Sosa Oaxaco Valley, Mexico, overcame their lack of funding for irrigation by attracting bilateral donor funding, which helped them create a Groundwater Technical Committee (GTC). Through the GTC, farmers were exposed to new methods of irrigation and ways in which to conserve watersheds. Using the funding, they built a 1.5 hectare greenhouse which housed a new irrigation system (including automated drip lines, sprinklers and sprayers). This approach has allowed the groundwater levels in the surrounding area to recover. Groundwater levels were initially depleted as a result of over-extraction, drought and inefficient water-use.

1. *Public-private partnerships (southern Africa)*

SMARTNET is a public-private partnership piloted in Tanzania that aims to overcome the barriers to distribution of mosquito nets through support to manufacturers, distribution agents and retailers using transport subsidies, payments for shipment and support for marketing.

1. *Trust and Retention Accounts (India)*

EcoHousingTrust and Retention Accounts (EcoTRA) is attempting to finance energy efficiency retrofits in existing residential buildings. EcoTRA proposes to establish trust and retention accounts to finance climate-friendly interventions in areas of co-operative housing societies. The third-party distribution mechanism will reduce the risk of lending, giving banks access to a large number of new clients. Co-operative housing societies will have increased access to finance and lower utility bills; energy efficiency service providers will receive additional business, and large-scale implementation will lead to lower greenhouse gas (GHG) emissions. The model will be tested in Thane city (population 1.2 million, Mumbai Metropolitan Region).

1. *Ethical financing for pro-poor carbon projects (South East Asia)*

Nexus, Carbon For Development is an alliance of pro-poor project developers whose vision is to use the carbon market to combat climate change and alleviate poverty in a sustainable manner. Low cost clean technologies contribute to both alleviating poverty and mitigating climate change. However, they lack appropriate funding mechanism for up-scaling and mass dissemination. Current carbon market practices often result in poor deals for social project developers, high transaction costs, inequitable risks and liabilities. As a member-based not-for-profit cooperative, Nexus proposes a new vertically integrated approach to carbon finance. The solution is based on three components: access long-term affordable financing, leverage traditional finance by reducing risk and costs and structure the sell side of the market in a fair trade way.

1. *Carbon bundling and energy lending (Nepal)*

Linking carbon finance and microfinance to accelerate access to renewable energy technologies in Nepal, Pay it Forward utilises future capital from the country’s emerging carbon trading market as collateral for new renewable energy lending. This initiative aligns players from across the lending spectrum (multilaterals, commercial banks, carbon brokers, micro-finance institutions) thus spreading risk and reward and, critically, motivating local lending. Working on a revolving basis, the carbon revenues realised through Pay it Forward will be channelled back into the programme for future renewable energy technologies lending, thereby returning liquidity into the system and ensuring its sustainability.

1. *Seed capital: smallholder farmer joint ventures (Liberia)*

Outgrowers to Shareholders (OtS) will fight poverty and chronic unemployment by accelerating the reconstruction of Liberia’s natural rubber industry. The microfinance revolution has largely bypassed agricultural activities including tree crop farmers which lack access to adequate capital. OtS combines existing financial instruments into a new, creative package, which allows long-term investment capital to reach decentralized smallholder farmers. By partnering with OtS in joint venture partnerships, smallholder farmers will acquire advantages presently only bestowed to larger plantations and thereby become a powerful force in Liberia’s development.

1. *Community lending against environmental assets (Indonesia)*

The rural poor’s most valuable assets are often intact environmental resources. A fundamental gap exists between the conservation and extractive value placed on those assets. An ‘environmental mortgage’ narrows that gap by melding innovative microfinance approaches with incentive structures that encourage environmental stewardship. It does so by explicitly linking a lending program focused on livelihood improvement to the quality of an environmental asset, resulting in long-term incentives for stewardship. Working with local partners, seven Indonesian fishing communities will have access to an economic development fund to help transition them to more sustainable fishing practices, while incentivizing the creation and stewardship of a local marine reserve network.

1. *Capitalization of the carbon bank*

Poverty reduction requires effective management and protection of ecosystems which provide food, water, and other goods and services. Wildlife Conservation Society (WCS) and Ecotrust Uganda propose the creation and capitalization of a carbon bank that will purchase carbon from small-holder farmers who plant trees for food, fodder, and fuelwood. The bank will make partial up-front payments and sell the aggregated sequestered carbon on the voluntary market to generate sustainable income, recapitalize itself and expand farmer participation. It will offer a highly replicable and scalable model for improving livelihoods and ecosystem services through smallholder farmer participation in the carbon markets.

1. *Innovative financial products for micro, small and medium enterprises (Bolivia)*

Through this initiative, Crimson Capital Corp. will work with a selected financial institution to establish a presence in Bolivia’s Northern Amazon Region (at least two full-service branches) and to develop, market and offer an innovative financial product (Purchase Order Finance (POF)) specifically designed to provide much-needed working capital to the regions bio-trade value chains. POF takes into consideration all the actors in the value chain: input and equipment suppliers, producers, processors, distributors, traders, wholesalers, retailers and end consumers rather than just the individual enterprise. The approach leverages existing relationships among those actors to guarantee loans without physical collateral requirements.

**Explanation of the carbon market**

Nigeria is a Non-Annex 1 Party under the United Nations Framework Convention on Climate Change (UNFCCC) and recently created a Designated National Authority (DNA) within its Federal Ministry of Environment, Housing & Urban Development. Nigeria is therefore eligible to propose projects under the Clean Development Mechanism (CDM). This could include an array of project types such as: i) reforestation/afforestation of degraded land (AR-AM0001, AR-AM0002 etc.); ii) land use conversion (AR-AM0004, AR-AM0007 etc.); iii) improving efficiency of water pumps (AM0020); iv) waste management (AM0025, AM0039 etc.); v) energy efficiency (AM0044, AM0046, AM0054 etc.); vi) optimization of hydropower (ACM0002); and vii) small scale methodologies that apply at the household/user level in agriculture and energy efficiency/generation (AMS-II.A etc.). These projects can earn Certified Emission Reductions (CERs) which can be sold on the carbon market to developed nations looking to offset their emissions. Nigeria could also consider implementing projects through a number of voluntary carbon markets such as the Voluntary Carbon Standard (VCS) and Gold Standard, which would earn Verified Emission Reductions (VERs) and can be sold on the voluntary carbon market. Additionally, projects can be registered through the Reduced Emissions from Deforestation and Degradation (REDD, and REDD+) methodology. REDD is an initiative to cut GHG emissions associated with forest clearing by the inclusion of ‘avoided deforestation’ in carbon market mechanisms. More simply, REDD equates to payment in return for the active preservation of existing forests. REDD+ gives additional consideration to sustainable forest management and afforestation/reforestation in developing countries. A number of these projects, particularly those based on natural resource management, can provide a dual focus of both mitigation and adaptation e.g. reforestation sequesters carbon but also restores soils and can provide barriers to erosion and the loss of productive agricultural lands (a form of Ecosystem Based Adaptation). Additional to these benefits is the cash earned for the activities, which can provide income for alternative livelihoods. See the section on Past and Ongoing Activities (in the main document) for a list of CDM projects registered in Nigeria. There are many opportunities for CDM activities in Nigeria due to the large fossil fuel reserves i.e. oil, gas and coal, which are sources of huge carbon emissions when extracted and processed. These emissions can be transformed into credits and sold on the carbon market.

The Adaptation Fund has been established by the Parties to the Kyoto Protocol of the UNFCCC to finance adaptation projects and programmes in developing countries that are particularly vulnerable to the adverse effects of climate change. Such countries (including Nigeria) are eligible to apply for project and/or programme funding, either using a National Implementing Entity or a Multilateral Implementing Entity. The Adaptation Fund is financed with 2% of the CERs issued for projects of the CDM and other sources of funding. The total available resources are expected to be between USD 250-350 million by 2012.

# ANNEX 6. Consultations held with key stakeholders

Meetings were conducted by the International Consultant (IC) Dr. Anthony Mills during the week 27th September – 1st October 2010.

27th September 2010, Abuja, Federal Capital Territory.

Attendees:

* Professor Salau, Climate Change Advisor, UNDP Country Office
* Mr. Muyiwa Odele, Environmental Focal Point, UNDP Country Office

27th September 2010, Abuja, Federal Capital Territory.

Attendees:

* Mr. Peter Tarfa Yerima, Assistant Director, Special Climate Change Unit, Federal Ministry of the Environment
* Dr. Victor Fodeke, Head, Special Climate Change Unit, Federal Ministry of the Environment

28th September 2010, Asaba, Delta State.

Attendees:

* The Honourable Environmental Commissioner, Delta State Ministry of Environment
* Director level representation from the following sectors in Delta State government (i.e. line ministries, and departments within the line ministries):
	+ Water Resources
	+ Health
	+ Power and Energy
	+ Agriculture
	+ Statistics
	+ Planning
	+ Environment
	+ Forestry
	+ Ecology
	+ Waste Management

29th September 2010, Asaba, Delta State.

Attendees:

* The Honourable Commissioner of Economic Planning, Bernard Okumagba, Delta State Ministry of Economic Planning
* Permanent Secretary, Delta State Ministry of Economic Planning
* The Honourable Environmental Commissioner, Delta State Ministry of Environment
* Directors of Departments within the Ministry of Economic Planning
* Mrs Felicia Adun, Director, Department of Waste Management, Delta State Ministry of Environment

29th September 2010, Asaba, Delta State.

Attendees:

* Mr. David Tope Oladiran, FEBI Foundation

30th September 2010, Asaba, Delta State.

Attendees:

* Mr. Patrick Okah, Rural Linkage Network
* Ms. Bridget Barr, International Center for Women Empowerment and Child Development
* Ms. Dorathy Akwugo Isi, International Center for Women Empowerment and Child Development

29th - 30th September 2010, Asaba, Delta State

* One to one meetings with the following sectors in Delta State government (i.e. line ministries, and departments within the line ministries):
	+ Water Resources
	+ Health
	+ Power and Energy
	+ Agriculture
	+ Statistics
	+ Planning
	+ Environment
	+ Forestry
	+ Ecology
	+ Waste Management

1 October 2010, Asaba, Delta State.

Attendees:

* Governor of Delta State, at his residence
* Ms. Ekundayo Akinmoyo, FEBI Foundation
* Professor Richard Steiner, University of Alaska, USA
* Professor Ayobami Salami, Institute of Ecology and Environmental Studies, Obafemi Owolowo University
* Ms. Felicia Adu, Director, Department of Waste Management, Delta State Ministry of Environment

1 October 2010, Asaba, Delta State.

Attendees:

* Ms. Ekundayo Akinmoyo, FEBI Foundation
* Professor Richard Steiner, University of Alaska, USA
* Professor Ayobami Salami, Institute of Ecology and Environmental Studies, Obafemi Owolowo University
* Mrs Felicia Adun, Director, Department of Sanitation and Waste Management, Delta State Ministry of Environment”

**Workshop on oil damage in Delta State**

29th September 2010, Asaba, Delta State. The workshop was hosted by The Honourable Environmental Commissioner, Delta State Ministry of Environment.

Attendees:

* Representatives from the private oil industry
* Mr. Tony Attah, manager of social performance and community affairs, Shell Nigeria
* Numerous community leaders and chiefs from accross Delta State
* Professor Richard Steiner, University of Alaska, USA
* Professor Ayobami Salami, Institute of Ecology and Environmental Studies, Obafemi Owolowo University

**Names and affiliations of people met[[246]](#footnote-246)**

* Professor Salau, Climate Change Advisor, UNDP Country Office
* Mr. Muyiwa Odele, Environmental Focal Point, UNDP Country Office
* Mr. Peter Tarfa Yerima, Assistant Director, Special Climate Change Unit, Federal Ministry of the Environment
* Dr. Victor Fodeke, Head, Special Climate Change Unit, Federal Ministry of the Environment
* The Honourable Commissioner of Economic Planning Bernard Okumagba, Delta State Ministry of Economic Planning
* Mrs. Ogbewe Ikialose Patience, Director, Overseas Development Assistance, Delta State Ministry of Economic Planning
* Mr. W.O. Riebelle, Permanent Secretary, Delta State Ministry of Environment
* Ms. Igini Uviomor Uvie, Senior Scientific Officer, Ecology Department, Delta State Ministry of Environment
* Mr. Ben Awana, Scientific Officer, Ecology Department, Delta State Ministry of Environment
* Ms. Felicia Adu, Director, Waste Management, Delta State Ministry of Environment
* Mr. David Tope Oladiran, member and board of trustees, FEBI Foundation
* Ms. Ekundayo Akinmoyo, FEBI Foundation
* Professor Ayobami Salami, Head, Space Applications and Environmental Science Laboratory, Institute of Ecology and Environmental Studies, Obafemi Owolowo University
* Dr. Imoh B. Obioh, Atmospheric Research and Information Analysis Laboratory, Center for Energy Research and Development, Obafemi Awolowo University
* Professor R. N. Okoh, Head of Department, Agricultural Economics and Extension, Delta State University
* Professor Richard Steiner, University of Alaska, USA
* Mr. Patrick Okoh, Professor of Biochemistry, Delta State University, and principal consultant for Rural Linkage Network
* Barr.Bridget Anyafulu, Executive Director, International Center for Women Empowerment and Child Development
* Ms. Dorathy Akwugo Isi, Director of Programmes, International Center for Women Empowerment and Child Development
* Mr. K Okoro, Director, Environmental Conservation, Delta State Ministry of Environment
* Mr. J. Y Ighrakpata, Director, Forestry, Mrs Felicia Adun, Director, Department of Sanitation and Waste Management, Delta State Ministry of Environment
* Mr Isaac Ofiofio, Assistant Director Ecology Department, Delta State Ministry of Environment
* Mr Lucky Adah, Chief Scientific Officer, Delta State Ministry of Environment
* Mr. Benedict Anaro, Senior Scientific Officer, Delta State Ministry of Environment
* Mr. Sylvester Ofuyekpone, Scientific Officer, Delta State Ministry of Environment
* Mrs Sally Obi, Senior Scientific Officer Delta State Ministry of Environment
* Mr. Felix Ogirisen, Senior Scientific Officer Delta State Ministry of Environment
* Mr. C. C. Igwoku, Assistant Agric Officer, Delta State Ministry of Agriculture and Natural Resources
* Mr. A.C Emikpe, Senior Agric Officer, Delta State Ministry of Agriculture and Natural Resources
* Mr. B..A Adeniyi Senior Agric Officer, Delta State Ministry of Agriculture and Natural Resources
* Senior Petroleum Engineer, Delta State Ministry of Energy
* Mr. Kennedy Waide, Scientific Officer, Delta State Ministry of Environment
* Mrs. R. E. Ohwevwo, Assistance Director, Delta State Ministry of Education
* Dr. C.C Ofili, Director, Delta State Primary Health Care Development Agency
* Mr. K. Ozegbe Hydrologist, Delta State Ministry of Water Resources
* Mr. U.Ekakite Hydrologist, Delta State Ministry of Water Resources

# ANNEX 7. Draft TORs For Key Project Staff

**TORs for the PSC**

The TORs for the PSC, which will be reviewed and finalized during the inception phase, include (but are not limited to) the following:

* Establish policies to define the functions, responsibilities, and delegation of powers for the implementing agency or agencies and the rest of the programme management team.
* Ensure policy decisions are line with the agreed project document and ensure policy consistencies between the Federal and Delta State Government and the funding agencies.
* Ensure the ITCP and TACC programme plans are consistent with discussions and directions of the SCCU.
* Guide and oversee progress of the TACC programme to ensure effective allocation of resources and ensure stated objectives are achieved.
* Develop and maintain close linkages with identified stakeholder groups.
* Ensure the high level support and participation of key stakeholders at national, state and district levels.
* Facilitate coordination of programme activities across institutions.
* Review delivery targets and budget allocations.
* Provide overall guidance on budget management and programme activities.
* Make decisions on issues brought to its attention by the PMU, CTA, WGs and any other members of the programme implementation team.

**TORs for Programme Manager**

(To be based in Asaba, Delta State)

**Roles and responsibilities**

* Provide overall co-ordination, management and supervision of programme implementation.
* Manage programme assets and human and financial resources in consultation with the PSC to achieve results in line with the outputs and activities outlined in the project document.
* Lead the preparation and implementation of the annual results-based work plans and results framework during the inception phase.
* Prepare periodic progress reports (including financial reports) on the programme as per UNDP requirements.
* Report and provide feedback on programme strategies, activities, progress, and barriers to the PSC and UNDP.
* Organize and facilitate national and regional workshops.
* Support the PSC by organising meetings and act as secretary during such meetings.
* Manage the hiring process for national and international experts, including drafting TORs and work specifications.
* Manage and monitor delivery of outputs by national and international experts and institutions working for the programme in line with TORs.
* Coordinate the international and national experts, and ensure the national staff receives all necessary training, templates, methodologies and support to undertake their data collection functions.
* Regularly liaise with programme partners and WGs.
* Plan for ensuring programme sustainability and replication
* Document lessons learned from the programme.
* Ensure that the necessary monitoring and tracking mechanisms are built into the daily and periodic activities during the programme implementation.
* Manage and monitor the programme risks initially identified, and submit new risks to the PSC for consideration and possible action. Update the status of these risks by maintaining the Programme Risks Log.

**Qualifications and skills**

* At least a Masters degree in environment, economics, development, or a closely related field.
* Demonstrated experience in successful work and collaboration with the Government of the Federal Republic of Nigeria.
* Experience of cooperation with non-government and research institutions, preferably in an area directly relevant to climate change.
* Technical knowledge of the implications of climate change on development, finance, environment and other relevant fields is critical.
* At least 7 years of work experience, preferably including project management experience.
* Demonstrable knowledge of climate change mitigation/adaptation and development.
* Experience in design of adaptation and/or mitigation programmes would be an asset.
* Ability to deliver on-time.
* Outstanding time-management, organizational and inter-personal skills.
* Excellent negotiation skills.
* Fluency in written and spoken English.
* Fluency in Pidgin English and at least one of the local languages used in Delta State would be an asset.
* Excellent writing skills.
* Excellent computer literacy.

**TORs for Chief Technical Advisor**(Part time)

**Roles and responsibilities**

* The CTA’s main tasks for the programme are to:
* Provide technical and strategic assistance to the PMU and the overall programme throughout the duration of the programme
* Provide quality assurance for development of the climate profile, business plans, policy revisions, feasibility studies and drafting of TORs for project activities.
* Provide expert advice for the drafting and implementation of REDD and other carbon offset market projects to ensure procurement of long-term carbon funding.
* Provide advice on the best suitable approaches and methodologies for achieving programme targets and objectives.
* Assist in the drafting of TORs for technical consultancies.
* Supervise and assist national and international technical consultants.
* Provide a technical supervisory function to the work carried out by the other technical assistance consultants hired by the programme.
* Together with the UNDPO CO, liaise with international partners to coordinate their support strategy for Nigeria.

**Qualifications and skills**

* At least a Masters degree in environment, economics, development, or a closely related field.
* Technical knowledge of the implications of climate change on development, finance, environment and other relevant fields is critical.
* At least 10 years of work experience, preferably including support to governments through policy and strategic interventions.
* Demonstrated in-depth knowledge of climate change adaptation and development.
* Demonstrated in-depth knowledge and experience in carbon financing.
* Expertise in designing adaptation and/or mitigation programmes, particularly REDD, afforestation and other projects that allow access to the carbon offset market.
* Experience in resource mobilization and partnership development.
* Experience of project management, preferably for UNDP, would be an asset.
* Outstanding time-management, organizational and inter-personal skills.
* Excellent negotiation and communication skills.
* Fluency in written and spoken English.
* Fluency in Pidgin English would be an asset.
* Excellent writing and reporting skills.
* Excellent computer literacy.

**TORs for Financial and Administrative Assistant**

(To be based in Asaba, Delta State)

**Duties and responsibilities**

The FAA will provide assistance to the PM in the implementation of day-to-day programme activities. He/she will be responsible for all administrative (contractual, organizational and logistical) and all accounting (disbursements, record-keeping, cash management) matters under the programme.

**Specific Tasks will include:**

* Provide general administrative support to ensure the smooth running of the programme management unit.
* Programme logistical support to the PM, CTA and programme consultants in conducting different programme activities (trainings, workshops, stakeholder consultations, arrangements of study tour, etc.).
* Provide visa support and organise transportation and hotel accommodation for international experts.
* Organize control of budget expenditures by preparing payment documents and compiling financial reports.
* Maintain the programme’s disbursement ledger and journal.
* File and administrate programme documents and expert reports.
* Control the usage of non-expendable equipment (record keeping, drawing up regular inventories).
* Maintain regular contact with programme experts and consultants to inform them about the programme details and changes.
* Provide English translation as required.
* Draft correspondence and documents; finalize correspondence of an administrative nature; edit reports and other documents to ensure correctness of form and content.
* Arrange duty travel.
* Act on telephone inquiries, fax, post, e-mails and co-ordinate appointments.
* Perform any other administrative/financial duties as requested by the Programme Manager.
* Organize and coordinate the procurement of services and goods under the programme.

**Qualifications and skills**

* Secondary school education.
* Fluency in written and spoken English.
* Fluency in Pidgin English and at least one of the local languages used in Delta State would be an asset
* Outstanding time-management, organizational and inter-personal skills.
* At least 3 years experience in office administration, preferably within UNDP programmes.
* Excellent computer literacy.

**Contractual and reporting arrangements**

The FAA will report to the Programme Manager and work under his/her direct supervision.

The FAA not undertake additional employment for the entire duration of the programme.

1. “GHG mitigation” is referred to as “GHG mitigation” throughout this document so as not to be confused with other types of mitigation. [↑](#footnote-ref-1)
2. UNDP, (2008) Climate change at UNDP: scaling up to meet the challenge. UNDP’s climate change strategy introduces four strategic priorities (SPs): (i) support the design of integrated Climate Change Policies, Strategies and Quantified Actions Plans; (ii) promote early adaptation actions and long-term adaptive capacity of developing countries in a programmatic manner; (iii) attract and drive direct private and public investment towards lower carbon technologies and sustainable land use practices; (iv) integrate climate change into UN and UNDP development assistance at the global, regional and national levels. [↑](#footnote-ref-2)
3. Available from <http://allafrica.com/stories/201009280687.html>, accessed 19 October 2010. [↑](#footnote-ref-3)
4. The Green Energy Society of Nigeria (GESON) has committed to a project titled “Make Nigeria Carbon Neutral by 2020”, which is supported by members of the Organized Private Sector (OPS). [↑](#footnote-ref-4)
5. Delta States Master Plan. [↑](#footnote-ref-5)
6. CIA World Fact book (Available from [www.cia.gov](http://www.cia.gov)). [↑](#footnote-ref-6)
7. CIA World Fact book (Available from [www.cia.gov](http://www.cia.gov)). [↑](#footnote-ref-7)
8. Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-8)
9. Mean maximum temperature in the south, for example, is 32°C whereas mean maximum temperature in the north is 41°C (First National Communication, 2003). [↑](#footnote-ref-9)
10. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change, November, 2003. [↑](#footnote-ref-10)
11. Federal Ministry of Environment of Nigeria: National Action Programme to combat Desertification. [↑](#footnote-ref-11)
12. Metz, H.C. (ed.) (1991). Nigeria: A Country Study. Washington: GPO for the Library of Congress, 1991. (Available from <http://countrystudies.us/nigeria/>, accessed 19 October 2010). [↑](#footnote-ref-12)
13. Federal Ministry of Environment of Nigeria: National Action Programme to Combat Desertification. [↑](#footnote-ref-13)
14. Federal Ministry of Environment of Nigeria: National Action Programme to Combat Desertification. [↑](#footnote-ref-14)
15. Federal Ministry of Environment of Nigeria: National Action Programme to combat Desertification. [↑](#footnote-ref-15)
16. Rapid deforestation has reduced Nigeria’s forest by 50 % in the past 15 years. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-16)
17. Available from <http://uk.oneworld.net/guides/nigeria/climate-change> [↑](#footnote-ref-17)
18. Global Forests Resources Assessment, FAO (2005). [↑](#footnote-ref-18)
19. Global Forests Resources Assessment, FAO (2010). [↑](#footnote-ref-19)
20. Federal Ministry of Environment, Nigeria Conservation Foundation, WWF UK and CEESP-IUCN (2005). Niger Delta Natural Resource Damage Assessment and Restoration Project, Phase 1 Scoping Report. [↑](#footnote-ref-20)
21. Imoobe, T.O.T and Iroro, T. (2008). Ecological restoration of oil spill sites in the Niger Delta, Nigeria. Journal of Sustainable Development in Africa. 11, 54 – 65. [↑](#footnote-ref-21)
22. Nwilo, P.C. and Badejo, O.T. Impacts and Management of Oil Spill Pollution along the Nigerian Coastal Areas. Available from <http://www.fig.net/pub/figpub/pub36/chapters/chapter_8.pdf> [↑](#footnote-ref-22)
23. Environmental Rights Action and the Climate Justice Program (2005). Gas flaring in Nigeria: a human rights, environmental and economic monstrosity. Amsterdam, the Netherlands. [↑](#footnote-ref-23)
24. Marland, G., T.A. Boden, and R.J. Andres. 2006. Global, Regional, and National Annual CO2 Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2003. Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, U.S. Department of Energy. CDIAC: Oak Ridge, Tennessee, USA. Available from <http://cdiac.esd.ornl.gov/ftp/ndp030/>  [↑](#footnote-ref-24)
25. Odjugo, P.A.O. and Osemwenkhae, E.J. (2009). Natural gas flaring affects microclimate and reduces maize (*Zea mays*) yield. International Journal of Agriculture and Biology. 11, 408-412. [↑](#footnote-ref-25)
26. CIA World Fact book (available from [www.cia.gov](http://www.cia.gov)). [↑](#footnote-ref-26)
27. As a result of oil pollution and the gas flaring and emissions from two stroke engines. [↑](#footnote-ref-27)
28. National Population Commission of Nigeria, 2006 census;and IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-28)
29. Nigeria has the third highest incidence of HIV/AIDS globally (CIA World Fact Book, available from [www.cia.gov](http://www.cia.gov)). [↑](#footnote-ref-29)
30. 2005-2010 estimate. CIA World Fact Book (available from [www.cia.gov](http://www.cia.gov)). [↑](#footnote-ref-30)
31. Defined as living with less than $1 US a day. 2007 estimate. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-31)
32. UNDP – Nigeria (2008). Country Programme Action Plan (CPAP). But see also World Fact book (available from [www.cia.gov](http://www.cia.gov)) and IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-32)
33. UNDP – Nigeria (2010). Country Programme Action Plan (CPAP). [↑](#footnote-ref-33)
34. Available from <http://www.ng.undp.org/reports/nigeria_mdg_report.pdf> . [↑](#footnote-ref-34)
35. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-35)
36. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-36)
37. UEMOA is an organisation of states to establish economic integration among countries sharing the same currency, namely the CFA franc. [↑](#footnote-ref-37)
38. National Economic Empowerment and Development Strategy, Nigerian National Planning Commission (2004). [↑](#footnote-ref-38)
39. Nigeria is also rich in solid mineral deposits, including coal, tin ore, kaolin, gypsum, columbite, gold, gemstones, barites, graphite, marble, tantalite, uranium, salt, soda, and sulphur. [↑](#footnote-ref-39)
40. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-40)
41. Prominent amongst which are natural gas, coal, tar sand and biomass. [↑](#footnote-ref-41)
42. 2003 estimate. [↑](#footnote-ref-42)
43. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change, November, 2003. [↑](#footnote-ref-43)
44. National Economic Empowerment and Development Strategy, Nigerian National Planning Commission (2004). [↑](#footnote-ref-44)
45. Odjugo, P.A.O. and Osemwenkhae, E.J. (2009). Natural gas flaring affects microclimate and reduces maize (*Zea mays*) yield. International Journal of Agriculture and Biology. 11, 408-412. [↑](#footnote-ref-45)
46. Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-46)
47. Information obtained during meetings in Asaba on 29/09/2010 – 30/09/2010 between the International Consultant (IC) and the Department of Energy, Delta State Ministry of Power and Energy, see Annex 6.

Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-47)
48. Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-48)
49. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-49)
50. 2007 estimate. CIA World Fact book (available from [www.cia.gov](http://www.cia.gov)). [↑](#footnote-ref-50)
51. UNDP – Nigeria (2008). Country Programme Action Plan (CPAP). [↑](#footnote-ref-51)
52. Federal Ministry of Environment of Nigeria: National Action Programme to combat Desertification. [↑](#footnote-ref-52)
53. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-53)
54. Available from http://www.nigerianational.com/-7-point-agenda. [↑](#footnote-ref-54)
55. Available from http://www.nigerianational.com/-vision-2020. [↑](#footnote-ref-55)
56. UNDP Nigeria Overarching Climate Change Strategy (2010). [↑](#footnote-ref-56)
57. Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-57)
58. Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-58)
59. Awosika (1995). Impacts of global climate change and sea level rise on coastal resources and energy development in Nigeria. In: Umolu, J. C. (ed). Global Climate Change: Impact on Energy Development. DAMTECH Nigeria Limited, Nigeria [↑](#footnote-ref-59)
60. Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-60)
61. Available from <http://en.wikipedia.org/wiki/Delta_State>, accessed 18 October 2010). [↑](#footnote-ref-61)
62. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-62)
63. A harmathan is a dry wind. [↑](#footnote-ref-63)
64. Iyayi, F. (2004). An integrated approach to development in the Niger Delta. A paper prepared for the Centre for Democracy and Development (CDD). [↑](#footnote-ref-64)
65. Awosika (1995). Impacts of global climate change and sea level rise on coastal resources and energy development in Nigeria. In: Umolu, J. C. (ed). Global Climate Change: Impact on Energy Development. DAMTECH Nigeria Limited, Nigeria. [↑](#footnote-ref-65)
66. Strategic Program for West Africa- Niger Delta Conservation Project PIF (2009). [↑](#footnote-ref-66)
67. Strategic Program for West Africa- Niger Delta Conservation Project PIF (2009). [↑](#footnote-ref-67)
68. *Nypa fruticans* Wurmb (the Nypa palm) is displacing valuable indigenous mangrove species such as rhizophora and raphia species in mangrove swamps. [↑](#footnote-ref-68)
69. Available from http://www.deltastate.gov.ng/eviroment1.htm [↑](#footnote-ref-69)
70. Sunderland, T.C.H. and Morakinyo, T. (2002). Nypa fruticans, a weed in West Africa. Palms 46, 154-155. [↑](#footnote-ref-70)
71. Sunderland, T.C.H. and Morakinyo, T. (2002). Nypa fruticans, a weed in West Africa. Palms 46, 154-155. [↑](#footnote-ref-71)
72. F. Blasco, P. Saenger & E. Janodet, 1996. Mangroves as indicators of coastal change. Catena 27, 167-178. [↑](#footnote-ref-72)
73. Laterite is an iron rock. [↑](#footnote-ref-73)
74. Available from <http://uk.oneworld.net/guides/nigeria/climate-change> [↑](#footnote-ref-74)
75. Oseji, J.O. (2007). Thermal gradient in the vicinity of Kwale/Okpai gas plant, Delta State, Nigeria, preliminary observations.The Environmentalist. 27, 311-314. [↑](#footnote-ref-75)
76. Press briefing on the activities of the Ministry of Environment (2006). Available from <http://www.deltastate.gov.ng/eviromentpressbrifing.htm> [↑](#footnote-ref-76)
77. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-77)
78. Delta State Ministry of Environment (2010).Delta State Government Climate Change Programme. [↑](#footnote-ref-78)
79. Ministry of Economic Planning. Delta State empowerment and development strategy (DELTA SEEDS). Zero draft. [↑](#footnote-ref-79)
80. Based on a nationwide annual population growth rate of 2%. IMF (2005). Nigeria: Poverty Reduction Strategy Paper (PRSP)—National Economic Empowerment and Development Strategy (NEEDS). [↑](#footnote-ref-80)
81. Available from http://en.wikipedia.org/wiki/Delta\_State. [↑](#footnote-ref-81)
82. Based on the 1991 census the population of the Niger Delta was estimated at 22 million people, with a nationwide annual growth rate of 1.999%. See Uyigue, E. & Agho, M. (2007) Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-82)
83. Information obtained during a meeting on 28 September 2010, in Asaba, between the IC and director level representation of the Agricultural Sector. [↑](#footnote-ref-83)
84. Information obtained during a meeting on 28 September 2010 in Asaba, between the IC and the Honourable Environmental Commissioner, Delta State of the Environment. [↑](#footnote-ref-84)
85. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-85)
86. Information obtained from meetings on 29/09/2010 – 30/09/2010 in Asaba, between the IC and representatives from departments and line ministries within Delta State government, see Annex 6. [↑](#footnote-ref-86)
87. Available from http://en.wikipedia.org/wiki/Local\_Government\_Areas\_of\_Nigeria. [↑](#footnote-ref-87)
88. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-88)
89. Nigeria Environmental Study/Action Team (NEST, 2004). Available from http://nestinteractive.org/climate\_change.php#). [↑](#footnote-ref-89)
90. Federal Ministry of Environment of Nigeria: National Action Programme to combat Desertification. [↑](#footnote-ref-90)
91. Odjugo, P. (2010). Regional evidence of climate change in Nigeria. Journal of Geography and Regional Planning. 3,142-150. [↑](#footnote-ref-91)
92. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-92)
93. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-93)
94. Uyigue, E. and Agho, M. (2007). Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-94)
95. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN).. [↑](#footnote-ref-95)
96. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-96)
97. Oladipo, E.O. (1995). An indication of abrupt change of rainfall and it potential impact on energy development in Nigeria. In: Umolu, J. C. (ed). Global Climate Change:Impact on Energy Development. DAMTECH Nigeria Limited, Nigeria. [↑](#footnote-ref-97)
98. Acheampong, P.K. (1990). Climatological drought in Nigeria. GeoJournal. 20, 209-219. [↑](#footnote-ref-98)
99. Federal Ministry of Environment of Nigeria: National Action Programme to combat Desertification. [↑](#footnote-ref-99)
100. There has been an average increase of 0.15-0.2 °C per decade globally since the 1970s, while the Sahel region has experienced an average warming of 0.2-0.8 °C over the same period. Source:Climate change in the Sahel:A challenge for sustainable development.Permanent Interstate Committee for Drought Control in the Sahel.AGRHYMET Regional Centre. Available from http://www.agrhymet.ne/PDF/Bulletin%20mensuel/specialChCang.pdf. [↑](#footnote-ref-100)
101. IPCC. (2007). Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. [↑](#footnote-ref-101)
102. UNDP Strategy Paper. (2010). Nigeria: Overarching Climate Change Strategy. [↑](#footnote-ref-102)
103. UNDP Strategy Paper. (2010). Nigeria: Overarching Climate Change Strategy. [↑](#footnote-ref-103)
104. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-104)
105. Odjugo, P. (2010). Regional evidence of climate change in Nigeria. Journal of Geography and Regional Planning. 3,142-150. [↑](#footnote-ref-105)
106. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-106)
107. Impact of climate change on Nigeria’s economy. 2009. DFID. [↑](#footnote-ref-107)
108. Ofili, C.C. (2010). Climate Change and Health in Delta State: Linking Infectious Diseases to Local Climate? Delta State Primary Health Care Development Agency. [↑](#footnote-ref-108)
109. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-109)
110. 2010 estimate. CIA world factbook. See: https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html. [↑](#footnote-ref-110)
111. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-111)
112. National Economic Empowerment and Development Strategy, Nigerian National Planning Commission. (2004). [↑](#footnote-ref-112)
113. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-113)
114. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-114)
115. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-115)
116. Obioha, E.E. (2009). Climate Variability, Environment Change and Food Security Nexus in Nigeria. Journal of Human Ecology. 26, 107-121. [↑](#footnote-ref-116)
117. Obioha, E.E. (2009). Climate Variability, Environment Change and Food Security Nexus in Nigeria. Journal of Human Ecology. 26, 107-121. [↑](#footnote-ref-117)
118. Nigeria’s First National Communication under the United Nations Framework Convention on Climate Change. (2003). [↑](#footnote-ref-118)
119. The Argungu festival on the Arungu River, in Kebbi State in the northern region, for example, is dependent on river flow, which is expected to decrease as a result of reduced rainfall in the north of the country due to climate change impacts. [↑](#footnote-ref-119)
120. Delta State Ministry of Environment. (2010). Delta State Government Climate Change Programme. [↑](#footnote-ref-120)
121. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-121)
122. Uyigue, E. and Agho, M. (2007). Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-122)
123. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-123)
124. Uyigue, E. and Agho, M. (2007). Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-124)
125. Marland, G., Boden, T.A. and Andres R.J. (2006). Global, Regional, and National Annual CO2 Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2003. Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, U.S. Department of Energy. CDIAC: Oak Ridge, Tennessee, USA. Available from http://cdiac.esd.ornl.gov/ftp/ndp030/. [↑](#footnote-ref-125)
126. Available from http://www.epa.gov/acidrain/effects/health.html. [↑](#footnote-ref-126)
127. Efe, S. I. (2010). Spatial variation in acid and some heavy metal composition of rainwater harvesting in the oil-producing region of Nigeria. Natural Hazards. 55, 307–319. [↑](#footnote-ref-127)
128. Etuonovbe, A.K. (2006). Coastal Erosion in Nigeria: A case study of Forcados South Point. A paper presented at the FIG congress Munich. [↑](#footnote-ref-128)
129. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-129)
130. Environmental Rights Action. (2005). Gas Flaring in Nigeria: a Human Rights, Environmental and Economic Monstrosity. [↑](#footnote-ref-130)
131. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-131)
132. Information obtained during a meeting in Asaba on 30/09/2010 between the IC and the International Women and Children’s Network, see Annex 6. [↑](#footnote-ref-132)
133. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-133)
134. Uyigue, E. and Agho, M. (2007). Coping with Climate Change and Environmental Degradation in the Niger Delta of Southern Nigeria. Community Research and Development Centre (CREDC). [↑](#footnote-ref-134)
135. Okoh, R.N., Okoh, P.N., Ijioma, M.A., Ajibefun, I.A., Idehen, K.I., Ajieh, P.C., Nwabueze, A.A., Ovharhe, O.J. and Emegbo, J. (2010). Assessment of Vulnerability and Impacts of Climate Change on Livelihoods of Communities in the Niger Delta States.

Rural Linkage Network (RULIN). [↑](#footnote-ref-135)
136. Christensen, J. H., Hewitson B. and Busuioc, A. (2007). Regional Climate Projections. - In: Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K. B., Tignor, M. and Miller, H. L. (eds.), Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, pp. 848-940. [↑](#footnote-ref-136)
137. Only some 4% of arable land in Africa is currently irrigated, making African farmers particularly vulnerable to fluctuations in rainfall. Source: Stern, N. (2006), Stern Review on the Economics of Climate Change. H.M. Treasury, United Kingdom. [↑](#footnote-ref-137)
138. Perales,C.M and Menendez, U (eds.) (2010). Getting the deal through: Environment 2010 in 27 Jurisdictions worldwide. [↑](#footnote-ref-138)
139. The Inter-ministerial Committee on Climate Change is comprised of the following ministries: Finance, Agriculture, Water Resources, Energy Commission, Nigerian National Petroleum Corporation (NNPC), Foreign Affairs, Nigerian Meteorological Agency (NIMET), industry, NGOs (Nigerian Environmental Study/ Action Team), and Academia (Centre for Climate Change a Fresh Water Resources; Federal University of Technology Minna, Centre for Energy, Research and Development; Obafemi Awolowo University Ile‐Ife, Abubakar Tafawa Balewa and the University, Bauchi). [↑](#footnote-ref-139)
140. Available from http://www.nestinteractive.org/climate\_change.php [↑](#footnote-ref-140)
141. Available from <http://www.nigeriaclimatechange.org/index.php> [↑](#footnote-ref-141)
142. Available from http://cdm.unfccc.int/Projects/registered.html [↑](#footnote-ref-142)
143. Available from http://www.specialclimatechangeunit-nigeria.org/ [↑](#footnote-ref-143)
144. Available from www.nigeriacan.org [↑](#footnote-ref-144)
145. Available from http://nigerianyouthclimatecoalition.blogspot.com/ [↑](#footnote-ref-145)
146. Available from [http://sgp.undp.org](http://sgp.undp.org/) [↑](#footnote-ref-146)
147. Available from [http://sgp.undp.org.html](http://sgp.undp.org/web/projects/16457/bioremediation_of_petroleum_contaminated_soils_in_emede_delta_state_nigeria.html) [↑](#footnote-ref-147)
148. Available from [http://sgp.undp.org.html](http://sgp.undp.org/web/projects/16422/isoko_afforestation_project_oleh_isoko_south_lga_delta_state.html) [↑](#footnote-ref-148)
149. Available from <http://sgp.undp.org.html> [↑](#footnote-ref-149)
150. Available from http://www.projectgaia.com/page.php?page=nigeria [↑](#footnote-ref-150)
151. Available from <http://forestindustries.eu/content/shining-prospects-redd-participation> [↑](#footnote-ref-151)
152. UNEP, The Environment in the News, 19 July 2010 .Available from http://www.unep.org/cpi/brief/2010July19.doc [↑](#footnote-ref-152)
153. Ite, U.E. and Adams, W.M. (1998). Forest conversion, conservation and forestry in Cross River State, Nigeria. Applied Geography 18, 301-314. [↑](#footnote-ref-153)
154. Available from <http://forestindustries.eu/content/shining-prospects-redd-participation> [↑](#footnote-ref-154)
155. Available from <http://www.idrc.ca/ccaa> [↑](#footnote-ref-155)
156. UNDP Nigeria Overarching Climate Change Strategy, 2010. [↑](#footnote-ref-156)
157. UNDP Nigeria overarching climate change strategy, 2010. [↑](#footnote-ref-157)
158. Available from <http://www.thegef.org/gef/sites/thegef.org/files/documents/C.36.Inf_.6%20Annex.pdf> [↑](#footnote-ref-158)
159. It belongs to the eastern part of the Guinean Forests Hotspot. [↑](#footnote-ref-159)
160. Strategic Program for West Africa- Niger Delta Conservation Project PIF (2009). [↑](#footnote-ref-160)
161. Information obtained during a meeting in Abuja on 27/09/2010 between the IC and Mr Victor Fedeke, Head of the Special Climate Change Unit, Federal Ministry of the Environment, see Annex 6. [↑](#footnote-ref-161)
162. Information obtained during a meeting in Asaba on 28/09/2010 between the IC and Delta State Ministry of Water Resources, see Annex 6. [↑](#footnote-ref-162)
163. Information obtained during a meeting in Abuja on 27/09/2010 between the IC and Mr Victor Fedeke, Head of the Special Climate Change Unit, Federal Ministry of the Environment, see Annex 6. [↑](#footnote-ref-163)
164. Information obtained during a meeting in Asaba on 28/09/2010 between the IC and Delta State Ministry of Water Resources, see Annex 6. [↑](#footnote-ref-164)
165. Information obtained during a workshop in Asaba on 29/09/2010 between the IC and the oil sector and NGOs, see Annex 6. [↑](#footnote-ref-165)
166. Information obtained during meetings in Asaba on 28/09/2010 - 1/10/2010 between the IC and Delta State Ministry of Water Resources, see Annex 6. [↑](#footnote-ref-166)
167. Climate change is not mentioned in the Delta Region Master Plan. [↑](#footnote-ref-167)
168. Information obtained during a meeting in Asaba on 29/09/2010 between the IC and Delta State Ministry of Economic Planning, see Annex 6. [↑](#footnote-ref-168)
169. <http://geson-ng.org/publication/index5.html> [↑](#footnote-ref-169)
170. Nigerian Environmental Study/Action Team (NEST, 2004). [↑](#footnote-ref-170)
171. Information obtained during meetings in Asaba on 29/09/2010 between the IC and Delta State Ministry of Economic Planning, see Annex 6. [↑](#footnote-ref-171)
172. Information obtained during a meeting s in Asaba on 28/09/2010 - 1/10/2010 between the IC and Delta State Ministry of Water Resources, see Annex 6. [↑](#footnote-ref-172)
173. Information obtained during meetings in Asaba on 28/09/2010 - 1/10/2010 involving the IC and the Department of Forestry, Delta State Ministry of Environment, see Annex 6. [↑](#footnote-ref-173)
174. The title of this CDM project is: “Recovery of associated gas that would otherwise be flared at Kwale oil-gas processing plant, Nigeria. [↑](#footnote-ref-174)
175. Information obtained during meetings in Asaba on 28/09/2010 – 1/10/2010 between the IC and Delta State Ministry of Power and Energy. [↑](#footnote-ref-175)
176. Information obtained during a meeting in Abuja on 27/09/2010 between the IC and Mr Victor Fedeke, Head of the Special Climate Change Unit, Federal Ministry of the Environment. [↑](#footnote-ref-176)
177. Information obtained during a meeting in Abuja on 27/09/2010 between the IC and Mr Victor Fodeke, Head of the Special Climate Change Unit, Federal Ministry of the Environment. [↑](#footnote-ref-177)
178. Reverse osmosis is the process by which water can be captured from the air. This is a potential adaptation measure, as water supply is currently limited and will likely become more limited with climate change. [↑](#footnote-ref-178)
179. Information obtained during a meeting in Abuja on 27/09/2010 between the IC and Mr Victor Fedeke, Head of the Special Climate Change Unit, Federal Ministry of the Environment. [↑](#footnote-ref-179)
180. The development of an ITCP for Delta State is based on recommendations contained within the UNDP’s primer on Integrating Climate Change Planning for Regional Governments (UNDP, 2009. Charting a New Low-Carbon Route to Development: A Primer on Integrated Climate Change Planning for Regional Governments). [↑](#footnote-ref-180)
181. Submitted by the Atmospheric Research and Information Analysis Laboratory. Center for Energy Research and Development. Obafemi Awolowo University Ile-Ife, Nigeria. This document was developed as part of the Canada-Nigeria Climate Change Capacity Development Project. [↑](#footnote-ref-181)
182. The Ecological Fund of Nigeria is apportioned 3% of Federal funds annually. Through the development of a sound ITCP and investment plans, this fund could be accessed for specific activities such as afforestation, reforestation and restoration projects. [↑](#footnote-ref-182)
183. Development of the Nigerian NASPA began in 2010. Details are available from: www.naspanigeria.org. [↑](#footnote-ref-183)
184. The Economic Planning Ministry, for example, should be prioritised for capacity building. [↑](#footnote-ref-184)
185. For example, a water policy is presently lacking within Delta State. Information obtained during a meeting in Asaba on 28/09/2010 between the IC and Delta State Ministry of Water Resources. [↑](#footnote-ref-185)
186. E.g. Health, Water, Energy, Agriculture, Forestry and Fisheries. [↑](#footnote-ref-186)
187. Information obtained during meetings in Asaba on 28/09/2010 – 1/10/2010 between the IC and Delta State Ministry of Health. [↑](#footnote-ref-187)
188. Information obtained during a meeting in Asaba on 28/09/2010 between the IC and Delta State Ministry of Water Resources. [↑](#footnote-ref-188)
189. The Economic Planning Ministry, for example, should be prioritised for capacity building. [↑](#footnote-ref-189)
190. E.g. health, water, energy, agriculture, forestry and fisheries. [↑](#footnote-ref-190)
191. This is based on mangrove restoration costing an average of US$ 6,000 per hectare (an average estimate based on Gillman and Ellison (2007)’s estimate that mangrove restoration can cost between US$ 2,150 and US$ 13,030) (Gilman, E. & Ellison, J. (2007), Efficacy of Alternative Low-cost Approaches to Mangrove Restoration, American Samoa, Estuaries and Coasts, 30, 641-651.).  [↑](#footnote-ref-191)
192. Guidebook available at http://www.lowcarbonportal.org/show/9F7555CD-F203-1EE9-BD14D2E2D3A5BC6C [↑](#footnote-ref-192)
193. E.g. health, water, energy, agriculture, forestry and fisheries. [↑](#footnote-ref-193)
194. National Action Programme to Combat Desertification. Federal Ministry of Environment of Nigeria. [↑](#footnote-ref-194)
195. The World Agroforestry Centre (known as the International Centre for Research in Agroforestry, ICRAF before 2002) describes agroforestry as a collective name for land use systems and practices in which woody perennials are intentionally integrated with crops and/or animals on the same land management unit, either in a spatial mixture or in a temporal cycle. Trees or shrubs are deliberately used within agricultural systems, or NTFPs are cultivated in forest settings. Biodiversity in agroforestry systems is typically higher than in conventional agricultural systems since several plant species are incorporated into a given piece land, creating a more complex habitat that can support a wide variety of fauna (bird, insects and animals). Agroforestry increases the resilience of the ecosystem and the communities through increased biodiversity and improved livelihoods, and is therefore a potential climate change mitigation and adaptation strategy. Available from: <http://en.wikipedia.org/wiki/World_Agroforestry>\_Centre. [↑](#footnote-ref-195)
196. FAO. (2005) Nigeria - The Nigerian cassava industry : Statistical handbook 2004. Food and Agriculture Organization of the United Nations, Rome, Italy. [↑](#footnote-ref-196)
197. Cardoso A.P., Ernesto M., Nicala D., Mirione E., Chavane L., N’zwala H., Chikumba S., Cliff J., Mabota A.P., Haque M.R., Bradbury J.H. (2004) Combination of cassava flour cyanide and urinary thiocyanate measurements of school children in Mozambique. International Journal of Food Sciences and Nutrition, 55, 183–190. [↑](#footnote-ref-197)
198. Gleadow, R.M., Evans, J.R., McCaffery, S., and Cavagnaro, T.R. (2009) Growth and nutritive value of cassava (*Manihot esculenta Cranz*.) are reduced when grown in elevated CO2. Plant Biology 11, 76-82. [↑](#footnote-ref-198)
199. IITA is a research institute, whose focal areas are to find solutions for hunger, malnutrition, and poverty in sub-Saharan Africa through research to: i) enhance crop quality and productivity; ii) reduce producer and consumer risks; and iii) generate wealth from agriculture. Available from <http://www.iita.org/home> [↑](#footnote-ref-199)
200. Osemeobo, G.B. & Ujor, G. (1999). The non-wood forest products of Nigeria. EC/FAO. Abuja, Nigeria. Available from ftp://ftp.fao.org/docrep/fao/003/X6695E/X6695E00.pdf; retrieved 21 October 2010 [↑](#footnote-ref-200)
201. Nkefor, J.P., Ndam, N., Blackmore, P.C. & Sunderland, T.C.H. (1998). The conservation through cultivation programme at the Limbe Botanic Garden: achievements and benefits in Sunderland, T.C.H., Clark, L.E. and Vantomme, P. (eds). Non-wood forest products of Central Africa: current research issues and prospects for conservation and development.FAO, Rome, Italy. [↑](#footnote-ref-201)
202. Burkill, H.M. (1994). The useful plants of West Tropical Africa. Volume 2: Families E-I. Kew Royal Botanic Gardens, Kew. [↑](#footnote-ref-202)
203. Osemeobo, G.B. & Ujor, G. (1999). The non-wood forest products of Nigeria. EC/FAO. Abuja, Nigeria. Available from ftp://ftp.fao.org/docrep/fao/003/X6695E/X6695E00.pdf; retrieved 21 October 2010 [↑](#footnote-ref-203)
204. Osemeobo, G.B. & Ujor, G. (1999). The non-wood forest products of Nigeria. EC/FAO. Abuja, Nigeria. Available from ftp://ftp.fao.org/docrep/fao/003/X6695E/X6695E00.pdf; retrieved 21 October 2010 [↑](#footnote-ref-204)
205. Available from <http://www.nepadst.org/platforms/foodloss.shtml>. [↑](#footnote-ref-205)
206. Mehmood, G. and Abbas, S. (2010) Feasibility and Design of Rainwater Harvesting Master Plan of Municipal Corporation of Gurgaon (MCG) Area. Jamia Millia Islamia University, New Delhi, India [↑](#footnote-ref-206)
207. Yuan, T., Fengmin, L., and Puhai, L. (2003) Economic analysis of rainwater harvesting and irrigation methods, with an example from China. Agricultural Water Management 60, 3, 217–226 [↑](#footnote-ref-207)
208. Available from http://www.airtowatertech.com/technology/cost.html. [↑](#footnote-ref-208)
209. AOSP. (2008) Solar Water Pumping Project: Ghana. Always On Solar Project. Available from http://www.sunepi.org/SunEPI/GHana\_files/Ghana\_Solar\_Pumping\_Project1.pdf [↑](#footnote-ref-209)
210. GEF (2000) Small Grants Program: Asia & Pacific: Thailand-2: Community-Scale Water Pumping, Thailand. Available from http://sgp.undp.org/download/SGP\_Thailand2.pdf [↑](#footnote-ref-210)
211. Available from http://www.gemswater.org. [↑](#footnote-ref-211)
212. Available from http://www.nrcs.usda.gov/programs/watershed/. [↑](#footnote-ref-212)
213. The Flood Early Warning System is available from<http://nigeriafews.net/>. See also: Federal Ministry of Environment (Department of Erosion, Flood and Coastal Zone Management) *in collaboration with* United Nations Development Programme. (2009). Establishment of Flood Early Warning System in Nigeria. Available from http://nigeriafews.net/floodresearch/reports/preliminary/establishment\_of\_fews\_nigeria.pdf. [↑](#footnote-ref-213)
214. Imoobe, T.O.T. and Iroro, T. (2009) Ecological restoration of oil spill sites in the Niger Delta, Nigeria. Journal of Sustainable Development in Africa 11 (2), 54-65. [↑](#footnote-ref-214)
215. WRM.(2001) WRM Bulletin no. 51, World Rainforest Movement. [↑](#footnote-ref-215)
216. Kinako, P.D. (1977) Conserving the mangrove forest of the Niger Delta. Biological Conservation. 11, 35-39. [↑](#footnote-ref-216)
217. IUCN,WWF,FME. (2006) Niger Delta Natural Resource Damage Assessment and Restoration Project: Phase I - scoping report. Port Harcourt, Nigeria. Available from http://cmsdata.iucn.org/downloads/niger\_delta\_natural\_resource\_damage\_assessment\_and\_restoration\_project\_recommendation.doc. [↑](#footnote-ref-217)
218. [N. O. Uluocha](http://www.springerlink.com/content/?Author=N.+O.+Uluocha), N.O. and [I. C. Okeke](http://www.springerlink.com/content/?Author=I.+C.+Okeke), I.C. (2004). Implications of wetlands degradation for water resources management: Lessons from Nigeria GeoJournal. 61, 151-154. [↑](#footnote-ref-218)
219. Ainodion, M., Robnett, C., and Ajose, T. (2002) Mangrove Restoration by an Operating Company in the Niger Delta. Proceedings of SPE International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production, Society of Petroleum Engineers. [↑](#footnote-ref-219)
220. Imoobe, T.O.T. and Iroro, T. (2009) Ecological restoration of oil spill sites in the Niger Delta, Nigeria. Journal of Sustainable Development in Africa 11 (2), 54-65. [↑](#footnote-ref-220)
221. Available from http://mangroveactionproject.org/map-programs. [↑](#footnote-ref-221)
222. Global Forests Resources Assessment, FAO (2005). [↑](#footnote-ref-222)
223. Global Forests Resources Assessment, FAO (2010). [↑](#footnote-ref-223)
224. WWF (2009) REDD Project implementation in the Peruvian Andean Amazon. Available from http://wwf.panda.org/who\_we\_are/wwf\_offices/peru/index.cfm?uProjectID=PE0871. [↑](#footnote-ref-224)
225. Available from http://redd-indonesia.org. [↑](#footnote-ref-225)
226. Community Based REDD Mechanisms for Sustainable Forest Management in Semi-Arid Areas (Case of Ngitilis in Shinyanga Region) Pilot Project**.** http://www.tatedo.org/cms/index.php?option=com\_content&view=article&id=61&Itemid=64. [↑](#footnote-ref-226)
227. Available from <http://www.crossriverstate.gov.ng/index.php?option=com_content&view=article&id=750:cross-river-is-committed-to-redd-imoke&catid=3:newsflash>. [↑](#footnote-ref-227)
228. GRL (2009) VCS Project Design Document: Reforestation in grassland areas of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania. Green Resources Ltd, Dar es Salaam, Tanzania. Available from http://www.climate-standards.org/projects/files/tanzania/ ufp\_mfp\_combined\_validation\_VCS\_PDD-1.pdf. [↑](#footnote-ref-228)
229. WSP. (2002) WSP Blue Gold Field Note 4: VIP Latrines in Zimbabwe: From Local Innovation to Global Sanitation Solution. Water and Sanitation Program, Nairobi. [↑](#footnote-ref-229)
230. The Carter Center (2005) Pit latrines for All Households: The experience of Hulet Eju Enessie Woreda, Amhara National Regional State, Northwest Ethiopia. Available from http://www.cartercenter.org/documents/2185.pdf. [↑](#footnote-ref-230)
231. Munga, S., Minakawa, N., Zhou, G., et al. (2006) Association between land cover and habitat productivity of malaria vectors in Western Kenyan Highlands. American Journal of Tropical Medicine and Hygiene. 74, 69-75. [↑](#footnote-ref-231)
232. Available from http://www.unicef.org/infobycountry/mozambique\_53406.html. [↑](#footnote-ref-232)
233. Baume, C.A. and Marin, M.C. (2007) Intra-household Mosquito Net Use in Ethiopia, Ghana, Mali, Nigeria, Senegal, and Zambia: Are Nets Being Used? Who in the Household Uses Them? American Journal of Tropical Medicine and Hygiene 77, 963-971. [↑](#footnote-ref-233)
234. EPA. (2005). Available from: http://www.methanetomarkets.org/partners/nigeria.aspx [↑](#footnote-ref-234)
235. Centre for People and Environment. (2010). Landfill recovery and use in Nigeria (Prefeasibility studies of using LFGE): Final report. Available from http://www.methanetomarkets.org/Data/347\_Landfill.Recovery.and.Use.in.Nigeria(LFGE)Final.Report.pdf. [↑](#footnote-ref-235)
236. [1]Environmental Rights Action and the Climate Justice Program (2005). Gas flaring in Nigeria: a human rights, environmental and economic monstrosity. Amsterdam, the Netherlands [↑](#footnote-ref-236)
237. [2] Available from <http://www.projectgaia.com/page.php?page=nigeria> [↑](#footnote-ref-237)
238. [3] Available from http://cdm.unfccc.int/Projects/registered.html [↑](#footnote-ref-238)
239. [4] Adedolapo, A. (2005) Nigeria Oil and Gas Law . Oil, Gas & Energy Law Intelligence. London [↑](#footnote-ref-239)
240. More information available from <http://www.deltastate.gov.ng/gaia.htm> and http://www.projectgaia.com/page.php?page=nigeria. [↑](#footnote-ref-240)
241. Available from [http://www.nercng.org](http://www.nercng.org/) [↑](#footnote-ref-241)
242. Available from <http://www.worldenergy.org/documents/ethiopia_june_30_vi_garba_nigeria.pdf> [↑](#footnote-ref-242)
243. Available from <http://www.worldenergy.org/documents/ethiopia_june_30_vi_garba_nigeria.pdf> [↑](#footnote-ref-243)
244. Available from <http://www.iceednigeria.org/mainnewsline.php?recordID=52> [↑](#footnote-ref-244)
245. Examples selected from, amongst other sources, the winners of the Marketplace on Innovative Financial (MIF) Solutions for Development Competition, co-hosted by the Agence Française de Développement (AFD), the Bill & Melinda Gates Foundation and the World Bank. Available from http://en.fininnov.org/main.php?page=laureat. [↑](#footnote-ref-245)
246. This list is to be updated after further consultation with Ms. Felicia Adu. [↑](#footnote-ref-246)