United Nations Industrial Development Organization

Climate Technology Centre & Network

Federal Ministry of Environment - Department of Climate Change

Federal Ministry of Science and Technology – Department of Environmental Sciences and Technology

Technology Needs Assessment and associated action plan for climate change mitigation and adaptation in Nigeria's most vulnerable economic sectors

Report detailing the technology prioritization process

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Contents

1. Introduction

To adhere to its commitment to the United Nations Framework Convention on Climate Change (UNFCCC) as a Party to the Convention, Nigeria aims to ascertain the types of technologies that are best applicable to its specific climate change situation though the Technology Needs Assessment (TNA) and associated action plan for climate change mitigation and adaptation in Nigeria's most vulnerable economic sectors. The TNA, in this regard, is designed to assist developing countries that are parties to the UNFCCC by determining the countries' technology priorities for the mitigation of greenhouse gas (GHG) emissions and adaptation to climate change impacts. In this context, Nigeria has requested for the support of Climate Technology Centre and Network (CTCN) and United Nations Industrial Development Organization (UNIDO) for the development of a TNA and associated action plan for climate change mitigation and adaptation. These documents will be used by Nigeria for the implementation of its climate action plans and for financing requests toward climate finance sources.

Nigeria has been committed in achieving its climate change targets and addressing the impacts of climate change. Nigeria has submitted its Third National Communication (TNC) to the UNFCCC in March 2020, following its submission of the First Biennial Update Report (BUR1) in 2018, and its Nationally Determined Contribution (NDC) in 2015. Despite Nigeria's progress in addressing climate change, these documents clearly highlight the challenges in mitigation and adaptation met by the country. The TNC also emphasizes the importance of technology transfers for Nigeria to address the impacts of climate change. The document also highlights some challenges the country faces in identifying and introducing technologies, such as inadequate awareness on available technologies, low capacity, poor understanding of commercial applications, intellectual property challenges and issues in terms of enabling environment, among others. The TNA and associated action plan, therefore, aims also to address these challenges faced by Nigeria in identifying and introducing technologies, as well as promote better coordination among stakeholders in implementing climate actions.

In this regard, as part of the TNA process, priority sectors for Nigeria were validated in the inception workshop conducted in September 2018, which was led by the Federal Ministry of Science and Technology (FMST), in collaboration with Federal Ministry of Environment's Department of Climate Change (FMEnv – DCC). The three priority sectors are not only key in addressing Nigeria's development challenges, but are also climate-sensitive and vulnerable to the impacts of climate change. The three priority sectors for Nigeria's TNA are: agriculture and land use, energy, and industry and commerce. The prioritized technologies, therefore, will be identified and validated for these three priority sectors.

This report in turn details the technology selection and prioritization process, which are critical aspects of the TNA process as it will lead to the development of the Technology Action Plans (TAPs). It will discuss the process of identifying the technologies, conducting the preliminary assessment of the technologies, as well as engaging with key stakeholders through the regional and validation workshops. The prioritized technologies will be the basis for establishing the TAPs, which will elaborate the detailed implementation plans for the technologies.

2. Methodology

2.1 Pre-selection of sub-sectors

For the TNA in Nigeria, three priority sectors have already been identified in the inception workshop in September 2018, which was led by the Federal Ministry of Science and Technology (FMST), in collaboration with Federal Ministry of Environment's Department of Climate Change (FMEnv – DCC). The three sectors selected for the TNA are agriculture and land use, energy, and industry and commerce. Consequently, the sub-sectors were pre-selected from these priority sectors, which constitutes the second step in conducting the TNA process.

To identify the sub-sectors, the consulting team reviewed and analyzed all key national strategies and sectoral policies to determine development and climate change priorities of the country. This process included the review of climate change priorities of Nigeria, including NDC, Biennial Update Report (BUR), and other relevant documents, as well as long-term development strategies including Vision 20:2020. This process is essential as prioritized technologies for the TNA need to contribute to both development and climate change priorities. Furthermore, sectoral policies, such as Agriculture Promotion Policy, National Energy Policy, and Nigeria Industrial Revolution Plan, were also reviewed to not only evaluate development priorities of Nigeria, but also to analyze Nigeria's sectoral targets. In total, 17 documents were reviewed and analyzed in this process, whereby the documents are listed in the following table:

Table 1: List of documents reviewed

	Policy/strategy/action plan reviewed
1.	Vision 20: 2020
2.	Transformation Agenda 2011 – 2015
3.	Intended Nationally Determined Contribution (INDC)
4.	First BUR (BUR1)
5.	Third National Communication
6.	National Policy on Climate Change (NPCC)
7.	National Action Plan on Gender and Climate Change for Nigeria
8.	Agriculture Promotion Policy
9.	Agriculture Policy
10.	National Forestry Policy
11.	National Energy Policy
12.	National Renewable Energy and Energy Efficiency Policy (NREEP)
13.	Rural Electrification Strategy and Implementation Plan

14.	National Energy Master Plan (draft)
15.	National Energy Efficiency Action Plan (NEEAP)
16.	Nigeria Industrial Revolution Plan
17.	Economic Recovery & Growth Plan

The review and assessment of key national strategies and sectoral policies listed in the table above led to identifying development strategies and climate change targets, and subsequently led to identifying the sub-sectors that can contribute to meeting these objectives and targets. After sub-sectors were identified, they were assessed against four criteria, namely:

- Potential for climate change mitigation (GHG emissions)
- Potential for climate change adaptation (vulnerability)
- Relevance to development priorities
- Overall enabling environment, including regulatory, institutional, financial and information

For each sub-sector, each criterion was scored from 0 to 3, with 3 being the highest.

- 3: High
- 2: Moderate
- 1: Low
- 0: None

As a result, each sub-sector was pre-scored by the consulting team, which was used s a reference to guide the actual selection and prioritization process by the key stakeholders at the validation workshop. The stakeholders' validation workshop was conducted as hybrid meeting in Abuja, Nigeria and on the virtual platform, in which a total of 47 stakeholders participated in the workshop, 26 physical participants and 21 virtual participants. During the stakeholders' validation workshop, the scoring for each sub-sector was discussed and assessed by the stakeholders, mainly taking into consideration the potential for climate change mitigation and adaptation, as well as the enabling environment. Through the discussions at the stakeholders' validation workshop, the scoring for each subsector and the prioritized subsectors are confirmed by the TNA committee, which in turn became the basis for preparing the long-list of technologies in the subsequent step. The prioritized subsectors were confirmed with consensus from the TNA Committee during the validation workshop: crop production, livestock production, forestry, energy supply, energy demand, energy efficiency, agribusiness and agro-allied sectors, solid minerals and metals, construction and manufacturing.

2.2 Long-list of technologies

After the prioritized sectors and subsectors were confirmed with consensus from the TNA Committee, the consulting team developed the preliminary long-list of technologies. These technologies were then evaluated based on the following criteria:

- Potential impact on climate change mitigation/greenhouse gas emissions reduction
- Potential impact on climate change adaptation
- Alignment with climate change policies and priorities

- Consideration of co-benefits (environmental, social, and economic)
- Technological constraints
- Readiness of Nigeria for the technology

Again, these each criterion was scored from 0 to 3, with 3 being the highest.

- 3: High
- 2: Moderate
- 1: Low
- 0: None

The result from this exercise provided a total score for each technology, which was used as a reference to guide the actual selection and prioritization of technologies in the validation workshop.

2.3 Regional and validation workshops

Once the initial assessment of the long-list of technologies was completed by the consulting team and local experts, 5 regional workshops were conducted to discuss region-specific issues on the technologies and seek prioritization inputs from the regional stakeholders. This gave the consulting team and members of the TNA Secretariat a better understanding of what is important for the region and regional needs, as well as on-going issues that need to be addressed in the region. The 5 regional workshops took place in Nigeria's 5 regions, namely, in Asaba (South-South zone; July 18th), Lagos (South-West zone; July 20th), Awka (South-East zone; July 22nd), Kano (North-West zone; July 25th), and Yola (North-East zone; July 28th).Prior to the regional workshops, the pre-selection of subsectors' report and the mitigation and adaptation TNA report were shared with the stakeholders for their reference, enabling them to have the know-how on the TNA methodology and prioritization process.

Several key inputs and comments were made by the stakeholders during the regional workshops. For instance, in the South-South zone, some participants raised the region-specific issue of controlling and managing water hyacinth and weeds, and asked whether there is a technology that can contribute to resolving this issue. Similarly, in the South-West zone, stakeholders raised the issue of mangrove deforestation, which is a region-specific issue for communities along Niger Delta. On the other hand, during the regional workshop in the South-East zone, participants suggested the implementation of run-of river hydropower as there are many rivers in the region. In the North-West zone, there was particular interest in reducing emissions from the cement industry and technologies that may be effective in addressing this issue. Finally, in the North-East zone, the importance of promoting coordination among stakeholders and enhancing educational opportunities on the technologies so that the public has more awareness and understanding on the potential benefits of the technologies. These inputs and comments by the regional stakeholders were taken into account during the validation workshop, assisting the prioritization of technologies.

The validation workshop took place on August 1st, 2022, which was also carried out as a hybrid meeting in Abuja and on the virtual platform (via Zoom). During the validation workshop, the stakeholders' feedback primarily focused on the assessment of prioritized technologies conducted by the consulting team and local experts. For the agriculture and land use, the importance of several technologies, such as climate smart agriculture and integrated climate change monitoring and early warning system, were highlighted. In addition, for the energy sector, technologies like biomass conversion and run-of-river hydropower and how these technologies

can be utilized to achieve Nigeria's climate change targets were discussed. Finally, for the industry and commerce sector, there were concerns over the waste heat recovery system and how the technology may not be suitable for Nigeria's context. Moreover, there were concerns regarding the technology of shifting to wooden buildings and how it may contribute to forest degradation. This issue was also raised during the regional workshops, especially in the South-South zone. After discussions on technologies for agriculture and land use, energy, and industry and commerce sectors, there was an independent session for validating the prioritized technologies, in which 26 technologies were identified and validated with consensus as prioritized technologies.

3. List of prioritized technologies

During the validation workshop, 2-3 technologies were prioritized per subsector, totaling 26 prioritized technologies. As a result, the following prioritized technologies were validated with consensus:

Table 2: List of prioritized technologies

Sector	Subsector	Technology
Agriculture and land use	Crop production	1. Climate Smart Agriculture (including drip irrigation) 2. Agricultural biotechnology (including crop diversification and new varieties) 3. Integrated Climate Change Monitoring and Early Warning System
	Livestock production	1. Selective breeding via controlled mating 2. Manure management 3. Livestock disease management
	Forestry	1. Agroforestry 2. Forest management techniques for mitigation (REDD+) 3. Ecosystem-based adaptation
Energy	Electricity supply	1. Solar PV/Concentrated Solar Power (Solar Thermal) 2. Waste-to-energy (biomass power generation) 3. Carbon Capture and Storage
	Energy demand	1. Improved cookstoves 2. Demand-side management 3. Smart grid
	Energy efficiency	1. Energy management systems 2. Energy efficient buildings 3. Energy efficiency standards and labels
Industry and commerce	Agribusiness and agro-allied sectors	1. Modular palm oil mills 2. Anaerobic digesters
	Solid minerals and metals	1. Use of alternative fuels

		2. Advanced grinding technologies 3. Unhydrated cement recycling
	Construction and manufacturing	1. Shifting to renewable sources for electricity 2. Disaster-resilient buildings 3. Zero energy buildings

4. Next Steps

Based on the prioritized technologies, as well as feedback received from the stakeholders during the regional and validation workshops, technology action plans will be developed by the consulting team. The technology action plans will elaborate detailed project ideas on implementing the prioritized technologies, which will include explanations on specific activities, estimated cost, and timeframe. After the technology action plans are developed, these will be validated with key stakeholders during the validation workshop.