Biomass Energy Conversion Technical Assistance - Monitoring & Evaluation (M&E) Plan and Impact Statement

Objective of the M&E Plan and Impact Statement:

This M&E Plan and Impact Statement has been designed based on the Biomass Energy Conversion Technical Assistance (TA) Response Plan to enable us the implementers to complete the Closure Report at the end of the assistance.

We have identified relevant quantitative and qualitative indicators as specified in the Closure Report. The indicators are specific, measurable, achievable, relevant, and time bound. They will be used to Monitor Activities, Outputs and anticipated Outcomes from the technical assistance and add to the M&E Plan and Impact Statement. Notwithstanding the prevailing Covid-19 situation, we will try our level best to collect all relevant data as described in the Monitoring & Evaluation Plan below. Aggregated data on selected indicators as well as an updated version of the Impact Statement will be presented in the Closure Report at the end of the assistance.

Basic Information	
Title of response plan	Request for technical assistance for a study on forest biomass energy conversion
Technical assistance reference number	2019000036
Country/ countries	Central Africa: The Republic of the Congo, the Democratic Republic of the Congo, the Central African Republic, the Republic of Cameroon, the Gabonese Republic, the Republic of Equatorial Guinea, the Republic of Chad and the Republic of Burundi. West Africa: The Republic of Benin, the Republic of Senegal, the Republic of Côte d'Ivoire, the Republic of Mali, Burkina Faso and the Togolese Republic Eastern Africa: The Republic of Djibouti
NDE focal points and organization	1. M. Aminou Raphiou, Point Focal CTCN Direction Nationale des Changements Climatiques, Ministère de l'Environnement Charge de la Gestion des Changements Climatiques, du Reboisement et de la Protection des Ressources Naturelles et Forestières, **Cotonou (Benin)** 2. M. Augustin Ngenzirabona, Directeur Général, Institut Géographique du Burundi, P.O. Box 34, Gitega 331, **Bujumbura (Burundi)** Focal point: M. Astere Nindamutsa 3. M. Ouedraogo Pamoussa, Représentant Directeur Général Conservation de la Nature

	3BP 7044 **Ouagadougou 3, (Burkina Faso)** M. Forghab Patrick Mbomba Deputy Managing Director, National Observatory on Climate Change (ONACC)Boulevard du 20 Mai, **Yaoundé (Cameroun)** 5. M. Maxi**me Thierry Dongbad**a-Tambano, Coordonnateur du projet d'Evaluation des Besoins Technologiques - Focal point Ministre de l'Environnement, de l'Ecologie et du Développement Durable, **Bangui, République de Centrafrique** 6. M. Mahamat Hassane Idriss Point Focal Direction des Ressources en Eau et de la Météorologie, Centre et Réseau des Technologies Climatiques pour le compte du Tchad, Ministère de l'environnement et des ressources halieutiques BP 2115, **Ndjaména, (Tchad)** 7. M. Joseph Badevokila Point Focal Ministère du Tourisme et de l'Environnement, Ministère de la Recherche Scientifique et de l'Innovation Tour Nabemba, 11e etage, Brazzaville, Congo; BP 2499 **Brazzaville, (Congo)** Point Focal : M. Andre Mfoukou Tsakala 8. M. Philippe Kouadio Kumasi Sustainable Environment and Energy Development Consulting Center **Abidjan (Côte d'Ivoire)** 9. M. Idriss Ismael Nour Directeur Adjoint de l'Environnement – Point Focal, Direction de l'Aménagement du Territoire et de l'Environnement, **Djibouti City (Djibouti)** 10. M. Santiago Francisco Engonga Osono, Directeur Général de l'Environnement - Focal point, Direction Générale de l'Environnement, Ministère de la Pêche et de l'Environnement **Malabo II, Malabo, Bioko-Norte, Equatorial Guinea** 11. M. Bernard Ndaye Nkanka, Professor and Chief, Section Electricité –

	Point Focal, Centre d'Études et de Recherches sur les Énergies Renouvelables kitsisa de L'institut Supérieur des Techniques Appliquées-lSTA Avenue Kabasele Joseph Proche de l'Aéroport National de NDOLO, Barumbu – **Kinshasa (RDC)** Point Focal, M. Bienvenu Mupenda Kitenge, Expert, Direction de Développement Durable 12. M. Brice BIYO'O BI MBENG Chef de Bureau Agence Gabonaise de Normalisation B.P: 19 134 **Libreville (Gabon) :** Point Focal, M. Nestor Mintsa, Director; Mme Ornela Chéryle Mathangoye 13. M. Birama Diarra, Directeur des Applications Météorologiques et climatologiques – Point Focal L'Agence Nationale de la Météorologie Route Aéroport Bamako Senou, Bp 237, **Bamako, (Mali)** 14. M. Issakha Youm Centre d'Etudes et de Recherches sur les Energies Renouvelables - Focal point Route du Service Géographique (HB-87) X Rue HB-478, Hann Bel-Air. B.P. 476, **Dakar, (Sénégal)** 15. Mme Mery Yaou Chef de cellule planification - Focal point Direction de l'Environnement / Ministère de l'Environnement et des Ressources Forestières, BP 4825, **Lomé, (Togo)**
Sector(s) addressed	Forestry, Energy and Environment
Technologies supported	Wood biomass technologies
Implementation period and total duration	12 months (March 2020 – March 2021)
Total budget for implementation	USD 245,900
Designer of the response plan	CTCN
Implementer of response plan	Climate and Energy (C&E) Advisory Limited and S2 Services

(A) Outputs and Activities as described in the Response Plan	(B) Indicator	(C) Expected results	(D) Method and frequency for data collection (Describe the expected method and frequency for data collection (e.g. survey, head count at a training workshop, etc)	(F) Comments
Output 1: Development of implementation planning and communication documents Activity 1.1: Work Plan Activity 1.2: Monitoring and evaluation plan Activity 1.3: A two-page CTCN Impact Description Activity 1.4: A Closure and Data Collection report completed at the end of the technical assistance.	1. Detailed work plan completed and approved by CTCN for distribution 2. Monitoring and Evaluation Plan with indicators completed. 3. Closure and Data Collection Report completed at the end of the project	Detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan & M&E Plan discussed with technical team and submitted to CTCN	Number of relevant project documents presented to CTCN. Number of engagement and communication plan presented to all stakeholders.	Kick-off meeting with the CTCN and NDE's. Brainstorming meetings with implementing specialists at the onset of the project. Brainstorming meetings at the onset of the project including sharing the workplan with all NDEs.
Output 2: Identification of the source of forest residues in the forest supply chain.	Number of cooperative researches, development, and demonstration programmes facilitated as a result of CTCN TA	Country maps of the potential pilot projects and analysis report showing how they were selected	Record of data and relevant information on potential forest residues identified in each country of study (government, agencies and project reports) discussed with stakeholders	Pilots with potential for generation of both heat and electricity to be given preference, among other socio-economic benefits
Activity 2.1: Mapping actors involved in the supply chain and flows of	Number of tools and technical documents strengthened, revised or	A report with the information collected that explains how supply chains work and at what	Literature review of relevant documents; key informant interviews; telephone and	

wood and their wastes. Georeferencing of the links where wood waste is generated in the supply chain.	developed in each country.	points the greatest amount of wood waste is generated.	Skype calls; site visits, analysis of data and information collected, and GIS mapping	
Activity 2.2: Quantification of the waste generated in each site of the supply chain	Number of tools and technical documents strengthened, revised or developed : Formulae for quantification of feasible waste developed. Number of chain links that offer best opportunities to use wood biomass optimally identified by the study.	A map that presents the geographical location of the hot spots of wood waste generation in the mapped supply chains.	Literature review of relevant documents; site visits and GIS mapping	Appropriate formulas used to quantify wood waste in other countries will be applicable to the 15 target countries.
Activity 2.3: Assess the feasibility of a pilot project.	Anticipated number of technologies transferred or deployed as a result of CTCN support	A report about the project's feasibility analysis and the prioritization methodology to select the pilot project.	Literature review of relevant documents; project feasibility analysis	
Output 3: Determine the requirements for and availability of technologies for converting the identified biomass resources.	1. Anticipated increased infrastructure resilience (avoided/mitigated climate induced damages and strengthened physical assets) 2. Anticipated increased ecosystem resilience	A report on the mount of GHG reduced by each technology in each country assuming technology operates optimally. Report on anticipated income from use of selected technologies	Description and manuals of the technology and their performance reports from literature review. Available technology testing, user guides and demonstration reports shared with stakeholders	

	(areas with increased resistance to climate-induced disturbances and with improved recovery rates) 3. Anticipated increased economic resilience (e.g. less reliance on vulnerable economic sectors or diversification of livelihood) Anticipated increased health and wellbeing of target group (e.g. improved basic health, water and food security)	Report on areas that will be restored as a result of CTCN TA Report on anticipated diversified income and increased livelihood as a result CTCN TA A report on anticipated health and wellbeing of beneficiary community as a result of CTCN TA	Land cover maps data showing future projection Socio-economic and household data in the target areas Data from health centres in the target community	
Activity 3.1: Identify the energy demands by sector for the selected countries and propose in which sectors the forest biomass potential can contribute, considering the current problem of traditional biomass consumption.	The number of sectors with high potential demand of bioenergy identified	A report on the energy demands by sector for the selected countries.	Literature review; Web Based Research and meetings	
Activity 3.2: For the	The number of	A report on the most	Web Based Research; literature	Ensure that conducive policy environment

proposals of point 3.1, determine the most appropriate conversion technologies, including pre-treatments and treatments of biomass to produce the final energy use for each proposed sector	technologies identified for each prioritised sector or deployed as a result of CTCN support. Anticipated technology types identified for deployment later.	appropriate conversion technologies, including pre-treatments and treatments of biomass to fulfil the final energy use for each proposed sector	review and field mission.	is available for application of the most viable technologies in each sector and people are willing to take up the technology.
Activity 3.3: In each proposed sector, define the project that best suits the country case study, the budget, the site design, the logistics and biomass suppliers.	Anticipated number of direct and indirect beneficiaries of bio-energy projects for each of the selected sectors as a result of CTCN TA (disaggregated by direct, indirect, mitigation, adaptation).	A report containing the design of the project that best suits each of the country's context.	Field mission; stakeholder meetings; and cost benefit analysis.	.
Output 4: Assessment of the sustainability of the suggested bio-energy solutions.	1. Anticipated metric tons of CO^2equivalent (CO^2e) emissions reduced or avoided as a result of the conversion technology.	Report influences national climate change discourse and policy reports such as the National Determined Contribution (NDC) targets, and the implementation of Sustainable development Goals	Environmental, financial and socio-economic assessments done by experts assisted by in-country consultants	Bioenergy solutions prioritized according to a number of socio-economic and environmental factors
Activity 4.1: Carry out an environmental impact assessment (GHG emissions, consumption	The amount GHG emission reduction associated with the various technologies. The amount of forest loss	Report on the environmental impact assessment, including risk and benefits, providing recommendations on actions to	Literature review; environmental and social risks assessment; GHG emission analysis.	Focus on both woody and non-woody residues depending on amounts

of natural resources, extraction forest residues).	reduction associated with improved bio-energy technologies.	mitigate risk and promote benefits		
Activity 4.2: Define the economic (business model, supply chain, funding sources, markets) factors and analyzing them.	The number of sustainable business models by different bioenergy solutions identified by the technical assistance (TA) describing itemizing their merits and demerits	Report on the economic factor risk and benefits analyzed, providing recommendations on actions to mitigate risk and promote benefits.	Literature review; meetings and site visits.	Assumes that demand for bioenergy is available
Activity 4.3: Define the social (policies, traditional biomass consumption social drivers, jobs) factors and analyzing them.	The number of policies, strategies and plans reviewed by the study. The number and type of social issues, impacts and benefits identified by the TA as a result of bio-energy end solutions.	Report on the social factor risk and benefits analyzed, providing recommendations on actions to mitigate risk and promote benefits. A gender mainstreaming specific analysis.	Literature review of documents, in country field mission and site visits.	
Output 5: Selection and the implementation of pilot projects (one per country)	Amount of funding/investment leveraged (USD) as a result of TA (disaggregated by public, private, national, and international sources, as well as between anticipated/confirmed funding)	Concept notes developed and finalized targeting potential donors	Concept notes and proposals written by beneficiaries	
Activity 5.1: The information generated in the output 2 will be used to prepare a pilot project	1. Number of Bankable business concepts and projects developed 2. Number of pilot	A report describing the selected pilot projects and their technical, social and financial attributes consistent	Literature review of documents and consultative meetings. with key stakeholders	Input of NDEs essential in finalizing pilots. Emphasis will be only replicable and bankable

in each country tailored to the local conditions based on replicability, engagement with local private sector and bankability noting that the possibility of merging projects in some of the countries with similar conditions should be taken in due account	projects that are replicable, are socially and environmentally acceptable and beneficial to community identified by the TA.			
Activity 5.2: The pilot project is elaborated, and its expected impact evaluated.	Number of pilot projects that are financially, economically and environmentally sustainable and replicable	Public and private funding available to ensure success of the pilots	Literature review of documents and consultative meetings with key stakeholders.	Pilots receive approval of the concept note submitted to various donors
Output 6: End of Project Dissemination Workshop	Number of private sector investors attend the workshop	Concepts approved by workshop attendees	Workshop report	Two regional workshops held in Central and West Africa
Activity 6.1: Hold a one-day workshop	1. The number of people attending the one-day workshop at the end of the project. 2. Recommendations that enhance implementation of sustainable pilots made	NDEs, private sector and key stakeholders to work with government and development partners to implement workshop recommendations	Workshop presentations, brainstorming and participatory plenary sessions.	Workshop supported by private sector and donors.

Note: The information in the table below will be used by the CTCN for public communication of the achieved and expected results of the Technical Assistance through the CTCN website www.ctc-n.org and other communication channels. See for example: https://www.ctc-n.org/sites/www.ctc-n.org/files/benin_a_ag_forestry.final_.pdf

Impact Statement	
Challenge	*Some 93 percent of rural households and 58 percent of urban households depend on wood biomass in Africa. Increasing use of traditional biomass charcoals and firewood is a direct cause of deforestation and forest degradation in many countries. Currently, the wood biomass conversion is highly inefficient and has very low recovery rates, yet there are various technologies that could be used to convert biomass to provide more convenient forms of bioenergy.*
CTCN assistance	• *Assess the bio-energy potential from sustainable biomass sources across 15 African countries, such as wood waste from forest harvesting operations and industry.* • *Improve afforestation and forest sector residues energy conversion.* • *Identify market opportunities for the private sector that will bypass the exploitation of traditional biomass sources.* *The selected countries are : Central Africa: The Republic of the Congo, the Democratic Republic of the Congo, the Central African Republic, the Republic of Cameroon, the Gabonese Republic, the Republic of Equatorial Guinea, the Republic of Chad and the Republic of Burundi. West Africa: The Republic of Benin, the Republic of Senegal, the Republic of Côte d'Ivoire, the Republic of Mali, Burkina Faso and the Togolese Republic Eastern Africa: The Republic of Djibouti*
Anticipated impact	• *Sustainable industrial chain for forest biomass energy conversion using planted forest as raw material and forestry biomass and sawmill waste.* • *Reduction of pressure on native forests.* • *Increase the final bio-energy use options such as cogeneration plants that use pyrolysis gases and waste.* • *Significant reduction of greenhouse gas emissions thanks to more*

	efficient charcoal production, waste conversion, increased forest cover, and decreased deforestation rates.
Anticipated co-benefits from the TA	*The key co-benefits from this TA include: Reduced greenhouse gas emissions, creation of employment through sustainable bio-energy projects; sustainable and efficient use of wood biomass, reduced discarded forest residues in wood processing value chains, contribution to the development of the COMIFAC Convergence Plan and national REDD+ processes, and facilitation and support to nationally determined contributions (NDCs). An additional anticipated co-benefit include gender mainstreaming recommendation in the forestry sector in selected countries.*
Gender aspects of the TA	*The forest sector has been slow in providing equal opportunities for African women who are critical actors in forestry and natural resources utilization and management. For sustainable management of forests in Africa to succeed, it should involve all stakeholders (policy makers, farmers, women, youth, local communities and agents). This gender dimension is very important and part of the TA therefore is to mainstream gender in all aspects of this study through desk and internet research, data collection (surveys), analysis and extensive literature reviews; review of gender policies and legal framework, review of gender structures, local initiatives and responsibilities in rural forest communities and households, identification of issues related to establishment of networks for women in forestry, face-to-face interviews with key gender stakeholders, and focus discussion group.*
Anticipated contribution to NDC	• *Reduced GHG emissions from deforestation and forest degradation* • *Improved forest site conditions for regeneration and planting thereby increasing carbon sequestration.* • *Production of electricity from sustainable sources such as forest biomass energy conversion and/or cogeneration.* • *Creation of a system of forest eco-industrialization in the sector*
The narrative story	*Demand for energy wood (wood charcoal and firewood) in the countries in the COMIFAC area is and has been a direct cause of deforestation and forest*

	degradation in the Congo basin. This growing demand is due to the combined effect of the following three underlying causes: (i) population growth, (ii) the absence of alternative energy sources appropriate for low-income populations, and (iii) inefficient production and use of wood charcoal. To address the wood biomass inefficiency challenge the Government of the Republic of the Congo, the Democratic Republic of the Congo, the Central African Republic, the Republic of Cameroon, the Gabonese Republic, the Republic of Equatorial Guinea, the Republic of Chad, the Republic of Burundi, the Republic of Senegal, the Republic of Côte d'Ivoire, the Republic of Mali, Burkina Faso, the Togolese Republic, the Republic of Benin and the Republic of Djibouti approached the CTCN for a technical assistance aimed at identifying various options for economical industrial conversion of forest waste through projects with a significant positive climatic and social impact. The CTCN technical assistance will promote projects that establish a sustainable industrial chain for forest biomass energy conversion using planted forest as raw material and forestry biomass and sawmill waste.
Contribution to SDGs	*SDG 7: Ensure access to affordable, reliable, sustainable, and modern energy for all* • *Industrial scale wood fuel will lower costs of production and improve its access; and* • *Industrial scale wood fuel and organization of artisanal producers will provide viable and sustainable wages for rural populations.* *SDG 13: Take urgent action to combat climate change and its impact* • *The information generated could be the base of new policies that promote the modern bio-energy sources from wood as a substitute to traditional biomass.* • *Planted forests as source of raw material will strengthen the adaptation option and land restoration; and* • *Industrial scale wood fuel will reduce the GHG emissions from current inefficient wood fuel production.* *SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss* • *Industrial scale wood fuel will reduce the pressure on natural forests and thus help to forest recovery; and* • *Reduced deforestation and degradation will lower GHG emissions by*

	each of the 15 countries supported. *SDG 5 : Gender equality - 5.1 : End of all forms of discrimination against all women and girls in selected countries.*