

Country	Republic of South Africa
Request ID#	202100021
Title	Individual tree monitoring and forest management strategies for carbon neutrality in Mbombela, South Africa
NDE	Department of Science and Innovation Kogilam Govender Deputy Director: Global Change and Sustainability kogilam.govender@dst.gov.za
Proponent	City of Mbombela Martin Pearson Manager of Parks Martin.Pearson@mbombela.gov.za 1 Nel Street, Mbombela 1200

Summary of the CTCN technical assistance

The summary should provide a brief description of the problem (barrier to climate technology deployment) and how the technical assistance will address it (brief summary of outputs and activities). Please also briefly indicate national actors involved and the anticipated timeline. Please note this summary will be used for public communication purposes so it is important that it is well written. (maximum 1250 characters including spaces)

Despite ongoing tree planting projects, a lack of monitoring systems made it impossible for the City of Mbombela (COM) to estimate the exact amount of carbon savings resulting from tree plantings. This technical assistance aims to establish a GIS-based individual tree monitoring system and suggest an optimal forest management plan for carbon neutrality in COM. To achieve this goal, first, partial forest inventory data will be collected by ground-based LiDAR and from existing satellite/aerial imagery. We plan to develop an ICT-based individual tree identifying and monitoring system using those data. Afterward, a carbon storage prediction model from the data retrieved from the individual tree monitoring system, future climate prediction data, and the opinions of policy decision-makers is developed. Different forest management plans and future climate scenarios based on Shared Socioeconomic Pathways (SSPs) will be applied to each model run. Considering climate change, we will propose optimal forest management guidelines that can contribute to carbon neutrality to the proponent. Finally, we plan to share the overall workflow with the stakeholders by training this procedure. Thus, the proponent will be able to manage the system on their own. This project will last for one year, starting with consultations with the NDE of South Africa and identified stakeholders.

Agreement:

(If possible, please use electronic signatures in Microsoft Word file format)

**National Designated Entity to the UNFCCC
Technology Mechanism**
Name: Kogilam Govender

Proponent (signature of the Proponent is optional)
Name: Martin Pearson



Title: Deputy Director of Global Change and Sustainability

Date: 26 February 2024

Signature:

Title: Manager of Parks

Date: 8 April 2024

Signature:

UNFCCC Climate Technology Centre and Network (CTCN)

Name: Rajiv Garg

Title: CTCN Director

Date:

Signature:

1. Background and context

Please provide a brief description of the background and context for the CTCN Response Plan. Please include national and sectoral information using recognized and publicly available sources. (maximum 2500 characters including spaces).

More than 80% of countries located on the African continent need international financial support to implement the Nationally Determined Contribution (NDC) submitted to the UN Climate Change Secretariat for their capacity building, technology transfer, and subsidies in the region (WMO 2022). Many nations possessing tropical forests, including South Africa, lack basic information for carbon storage assessment due to the absence of comprehensive forest resource surveys and limited technological capabilities in forest monitoring (Mitchard 2018). To maximize the profits of developing countries participating in the international carbon market, understanding the changes in the carbon storage of forests according to climate change and relevant policies is necessary.

According to the Global Forest Resources Assessment 2020 South Africa Report (FAO, 2020), the total forest area of South Africa was 17,268,000 ha in 2014, which is 14.1% of the entire region. Of that, only 428,000 ha is indigenous forest, 1,270,000 ha is plantation, and the rest consist of bushes and thickets. According to other statistics from Forestry 2030 Roadmap (Department of Agriculture, Forestry and Fisheries, 2009), Mpumalanga province, in which the City of Mbombela is located, accounted for 49% of the total plantation area of South Africa, which was the largest among other provinces. Considering the high proportion of plantations, a systematic forest management plan is needed, especially in the Mpumalanga province, which will contribute to climate change mitigation. Many projects have been implemented and are ongoing in the region's forest sector. For example, since 1983, the first week of September has been established as the Arbor week. So, annually, during the week, all provinces and municipalities engage in tree planting as a practical and symbolic action of sustainable environmental management. Started in 2021, the Ten Million Trees Programme is on its way as a 5-year project. It aims to plant 2 million trees per year to plant 10 million trees in the cumulative 5 years. So far, the programme has succeeded in planting 2.8 million trees until September 2023. At the municipality level, COM has its own tree planting program to prevent species extinction and increase carbon storage and sequestration. Although South Africa has the highest CO₂ emissions on the continent (Global Carbon Project 2021), these tree-planting projects will significantly help achieve carbon neutrality, and it is essential to have a forest monitoring system to ensure that these greening projects can operate effectively.



<p>throughout the implementation process. This meeting will be held in person. It is expected that a maximum of 15 persons will participate.</p> <p>Thereafter, regular working group meetings will be organized.</p>													
<p>Deliverables:</p> <p>1.1 Stakeholder mapping report containing a complete stakeholder list.</p> <p>1.2 Minutes of the consultative meetings.</p> <p>1.3 Minute Report of the inception workshop and regular workshop meetings with the list of participants, disaggregated by gender, materials used of the workshops and photos of the event.</p>													
<p>Output 2: Data preparation for the tree monitoring system</p>													
<p>Activity 2.1: Meeting for the agreement on the direction of the project</p> <p>To briefly share ideas and to settle the direction of the project, a meeting will be held between SNU team members. For this to be done, the main contents of the Technology concept submission form will be shared, the equipment and technologies that can be utilized will be checked and possible methods and dates of field survey will be discussed.</p>													
<p>Activity 2.2: Kick-off meeting via virtual platform</p> <p>To discuss and provide the terms of reference for the project, a kick-off meeting will be held via Microsoft Teams meeting. The participants will be Seoul National University researchers, the Proponent and NDE of South Africa, UN CTCN Climate Technology Specialists. Each member will make an introduction for themselves. SNU will give a presentation on the concept of the project and the City of Mbombela gave a presentation for their demand and comments about the presentation of SNU.</p>													
<p>Activity 2.3: Arranging the schedule for the visit to the City of Mbombela and the field survey</p> <p>Recommended hotels and available dates will be asked to the City of Mbombela. By considering the schedule of SNU researchers, the schedule of the visit will be set and airlines will be booked.</p>													
<p>Activity 2.4: Request and inquiry for existing data for City of Mbombela</p>													



<p>Existing data and acquirable data decide the availability of models. So, inquiring about existing data is needed. The data in question will be forest inventory data, forest stand map, tree species distribution data, land use map, species-specific allometric equations, yield tables, and soil maps. The existence of those data will be inquired to the City of Mbombela and the University of Mpumalanga.</p>													
<p>Activity 2.5: Sample site selection for field survey</p> <p>Sample sites will be selected using existing remote sensing data before field survey to predict the overall characteristics of the forest of COM. The stratified sampling method will be used by referencing the national land use map of South Africa.</p>													
<p>Activity 2.6: Field survey of forest for data collection using ground-based LiDAR</p> <p>Some of our team members are planning to visit COM. We are going to use our observation equipment including terrestrial LiDAR to make observations on forests and plantations.</p>													
<p>Activity 2.7: Existing satellite/aerial imagery collection</p> <p>Satellite data comes in a wide variety, and it is essential to use the data appropriately depending on the intended purpose. Available types of satellite data include RapidEye, WorldView-2, Sentinel, and ALOS PALSAR. RapidEye and WorldView-2 are commercial satellites known for their high spatial resolution, but they also come at a substantial cost. Regarding spectral resolution, most satellites provide bands for Red, Green, Blue (RGB), Near-Infrared (NIR), and Red Edge, while satellites like ALOS PALSAR can capture data from active sensors related to Synthetic Aperture Radar (SAR). In this context, we will explore two different analysis tools: Google Earth Engine and R programming.</p> <p>Google Earth Engine and R provide access to and processing capabilities for public satellite imagery, including data from satellites like Landsat, Sentinel, or MODIS. These tools allow users to filter data to their desired spatial and temporal extents and perform tasks such as visualization, calculation of necessary indices, and various transformations to meet their specific analytical needs</p>													
<p>Activity 2.8: Labeling remote sensing data including LiDAR data and satellite/aerial imagery</p>													



<p>considering the impact of climate change and forest management policies, using a carbon storage model</p> <p>Based on regular multi-stakeholder inception workshop meetings(Activity 1.3), some scenarios will be made that depict several kinds of policies that can take place in the future. These may include the climate change data made in Activity 3.2. Then, the model will be run based on remote sensing, field survey data, and the scenarios.</p>													
<p>Activity 3.5: Adjustment of model parameters by repeated model runs</p> <p>After measuring Ecosystem Services in Activity 3.3, the stakeholders in COM may adjust the parameters to maximize the potential value of their forest. Trade-off methods such as Multi-Criteria Analysis (MCA) would be used to evaluate the coefficients of parameters.</p>													
<p>Activity 3.6: Construction of a decision support system</p> <p>After integrating the formal results, a manual based forest carbon adaptation strategy will be established. This forest carbon policy guide is based on the Climate Change Response Framework (Ontl et al., 2020), and decision makers can establish a long-term forest management policy through it.</p>													
<p>Deliverable 3: Integrated Forest policy decision support system</p>													
<p>Output 4: System management and Capacity Building</p>													
<p>Activity 4.1: Definition of system management</p> <p>By considering available resources, the extent of system management will be defined for the use after the system’s development.</p>													
<p>Activity 4.2: Capacity building on the use of integrated forest policy decision support system</p> <p>There will be some sessions for the decision makers to learn how to use the system. Resources for these sessions will be made in advance. During the sessions, the overall concept and mechanism of the forest policy decision support system that was developed will be introduced to the ones who would be able to manage the system such as the personnel of the City of Mbombela or the University of Mpumalanga, so that they could maintain and develop the system on their own even after the end of this project. In order to achieve this objective, several virtual meetings can be</p>													



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Output 1: Development of implementation planning and communication documents						
Activity 1.1: Formulation of i) Detailed work plan, ii) Monitoring and evaluation plan, iii) CTCN Impact Description, iv) Closure and Data Collection report.	Please allocate 1-3 working days for each of the mandatory reports under Activity 1.1. E1: 10 days E2: 10 days E3: 10 days E4: 10 days A1: 10 days A2: 10 days				\$ 3,900	\$ 5,000
Activity #: Researchers meeting for the agreement on the direction of the project	E1: 1 day E2: 1 day E3: 1 day E4: 1 day A1: 1 day A2: 1 day				\$ 500	\$ 800
Activity 1.2: Response plan draft writing and sharing	E1: 8 days E2: 8 days E3: 8 days E4: 8 days A1: 8 days A2: 8 days				\$ 3,200	\$ 4,300
Activity 1.3: Kick-off meeting via virtual platform	E1: 1 day E2: 1 day E3: 1 day E4: 1 day A1: 1 day A2: 1 day		[Virtual meeting] Kick-off meeting, 8 participants, 1 day	Virtual meeting platform (Microsoft Teams or Zoom)	\$ 500	\$ 800
Activity 1.4: Arranging schedule for the visit and field survey	E1: 3 days E4: 3 days A1: 3 days A2: 3 days				\$ 1,200	\$ 2,400
Output 2:						



Data collection for the tree monitoring system						
Activity 2.1: Request and inquiry for existing data for City of Mbombela	E1: 2 days E2: 2 days E3: 2 days E4: 2 days A1: 2 days A2: 2 days				\$ 800	\$ 1,700
Activity 2.2: Sample site selection for field survey	E1: 2 days E2: 2 days E3: 2 days E4: 2 days A1: 2 days A2: 2 days				\$ 800	\$ 1,700
Activity 2.3: Field survey of forest for data collection using ground-based LiDAR	E1: 9 days E2: 9 days E3: 9 days E4: 9 days A1: 9 days A2: 9 days	[International travel] 9 days of international travel for field survey		One ground-based LiDAR(Leica BLK 360 G2), other measuring equipments for the field survey. One van with driver rented for field survey.	\$ 33,000	\$ 35,000
Activity 2.4: Existing satellite/aerial imagery collection	E4: 7 days			Satellite/aerial imagery, including free-to-use images from LandSat, Sentinel, and others, as well as high-resolution photos that require commercial purchase.	\$ 4,500	\$ 6,000
Activity 2.5: Labeling remote sensing data including LiDAR data and satellite/aerial imagery	E1: 5 days E4: 20 days A1: 5 days A2: 5 days		3 participants, 7 days	Online data labeling platform (e.g., Roboflow)	\$ 16,500	\$ 20,000
Output 3: Development of forest management strategy and system for						



carbon neutrality						
Activity 3.1: Selection of carbon storage model available for City of Mbombela	E1: 6 days E4: 3 days A1: 6 days A2: 6 days				\$ 2,400	\$ 3,000
Activity 3.2: Future climate change data construction based on SSP scenarios	E1: 5 days A1: 5 days A2: 5 days				\$ 2,000	\$ 3,000
Activity 3.3: Meeting with policy decision-makers and stakeholders related to the forestry sector	E1: 1 days E2: 1 days E3: 1 days E4: 1 days A1: 1 days A2: 1 days		[Virtual meeting] Policy decision-makers and stakeholders meeting, 10 participants, 1 day	Virtual meeting platform (Microsoft Teams or Zoom)	\$ 800	\$ 1,000
Activity 3.4: Prediction of carbon storage changes by considering the impact of climate change and forest management policies, using carbon storage model	E1: 30 days E2: 10 days E3: 10 days E4: 30 days A1: 30 days A2: 30 days				\$ 11,900	\$ 17,000
Activity 3.5: Adjustment of model parameters by repeated model runs	E1: 10 days E2: 5 days E3: 5 days E4: 15 days A1: 10 days A2: 10 days				\$ 3,900	\$ 6,000
Activity 3.6: Construction of a decision support	E1: 30 days E2: 30 days E3: 30 days E4: 30 days				\$ 13,500	\$ 20,000

system (2 차년도)	A1: 30 days A2: 30 days					
Deliverable 2: Integrated forest policy decision support system						
Activity 3.7: Educating how to use the integrated forest policy decision support system	E1: 7 days E2: 7 days E3: 7 days E4: 7 days A1: 7 days A2: 7 days		[Virtual meeting] User education meeting, 5 participants, 1~3 day	Virtual meeting platform (Microsoft Teams or Zoom)	\$ 3,800	\$ 4,800
Activity 3.8: Receiving feedbacks from the users	E1: 3 days E2: 3 days E3: 3 days E4: 3 days A1: 3 days A2: 3 days		[Virtual meeting] Feedback meeting, 8 participants, 1~3 day	Virtual meeting platform (Microsoft Teams or Zoom)	\$ 2,300	\$ 2,700
Activity 3.8: System Management and Maintenance Plan	E4: ~ 10 days		[Virtual meeting] Feedback meeting, 3 participants		\$ 500	\$ 600
Estimated range of costing for the entire Response Plan					\$ 106,000	\$ 135,800

5. Profile and experience of experts

Based on the required Human Resources identified in section 4 (Resources required and itemized budget) please provide a description of the required profile of all involved experts for the implementation of the CTCN Response Plan.

Experts required	Brief description of required profile
<i>Please use the same titles for all experts as applied in section 4.</i>	<i>Please provide a short description of expertise and experience needed (education, sectors of expertise, years of experience, country experience, language requirements, etc.).</i>
Team leader and expert in conservation planning (E1)	This expert shall have the ability of : <ul style="list-style-type: none"> • Doctor of Philosophy in Geography • A minimum of 15 years of relevant work experience in forest ecological modeling using climate change scenarios and spatial big

	<p>data analysis, or similar.</p> <ul style="list-style-type: none"> • Experience in research on predicting the impacts of climate change on ecosystems and establishing climate change adaptation strategies • Conducted research on forest management and conservation plans for various regional scales considering climate change and natural disasters • Fluency and good communication skills in English are required.
Tree physiology expert (E2)	<p>This expert shall have the ability of :</p> <ul style="list-style-type: none"> • Doctor of Philosophy in Environment • Expert in tree physiology • Experience in researching the impact of climate change on forest ecosystems for more than 20 years. • Previous experience in South Africa will be valued. • Fluency and good communication skills in English are required.
International forestry cooperation expert (E3)	<p>This expert shall have the ability of :</p> <ul style="list-style-type: none"> • Doctor of Philosophy in Soil Science • Experience of serving as the president of a forest science research institute and researching on forestry's response to climate change • Experience in studying methods of grasping the change in carbon stock for the REDD+ pilot project in tropical country (Indonesia) and participating in preliminary feasibility studies for promoting ODA in the forestry sector in African country (Ethiopia). • Previous experience in South Africa will be valued. • Fluency and good communication skills in English are required.
Artificial intelligence expert (E4)	<p>This expert shall have the ability of :</p> <ul style="list-style-type: none"> • Master's degree in forestry • A minimum of 7 years of extensive experience in programming (Python / R / Javascript / C++) and machine learning, specializing in computer vision using RGB cameras and LiDAR. • Capability of producing AI-based solutions in the fields of forestry, environmental climate, and artificial intelligence. • Previous experience in South Africa will be valued. • Fluency and good communication skills in English are required.
Field Survey Manager (A1)	<p>This assistant shall have the ability of :</p> <ul style="list-style-type: none"> • Master student in forestry • Have experience in planning and executing various field surveys and familiar with setting up sample plots across wide areas. • Previous experience in South Africa will be valued. • Fluency and good communication skills in English are required.
Research Assistant (A2)	<p>This assistant shall have the ability of :</p> <ul style="list-style-type: none"> • Undergraduate student in forest science program • Previous experience in South Africa will be valued. • Fluency and good communication skills in English are required.

6. **Intended contribution to impact over time**

Please provide a brief description of the intended contribution to impact over time of the outcome and outputs provided by this technical assistance on resilience to climate change and/or carbon abatement. To the extent possible, please quantify the intended impact contribution, for example by indicated estimated number of people potentially impacted over time, GDP contribution of the focus

sector, carbon emissions by the focus sector, etc. This intended contribution to impact is what will happen if the objective (as articulated in section 3) is met. Please ensure relevant complementarity with text in sections 7 to 12. (maximum 1250 characters including spaces)

This technical assistance can contribute to forest protection and emissions control policy-making by providing actionable forest management information and current carbon storage data in Mbombela. It also contributes to establishing a system that provides the basic information for calculating carbon credits, which is essential for future carbon trading and implementing forest-based climate mitigation strategies.

This technical assistance will propose a forest management plan for the city of Mbombela and provide accurate, science-based information about the region's forests. It will help policymakers, forest managers, and land stakeholders respond rapidly to climate change pressures on forests.

In conclusion, it is expected to increase public trust in forest management, reduce illegal logging, encourage and reward more sustainable forest management, and support forest sector adaptation to climate change.

7. Relevance to NDCs and other national priorities

Please identify relevance and contribution from the technical assistance to the Nationally Intended Contributions (NDC) and other relevant national prioritized efforts (TNAs, TAPs, NAPs, NAMAs, etc.). (maximum 2500 characters including spaces)

South Africa First Nationally Determined Contribution under the Paris Agreement - updated September 2021(2021)

- Goal 2: Develop an understanding of the impacts on South Africa of 1.5 and 2°C global warming and the underlying global emission pathways through geospatial mapping of the physical climate hazards, and adaptation needs in the context of strengthening the key sectors of the economy. South Africa planned developing tools and systems to support climate change adaptation according to their Goal 2.

- Goal 3: Implementation of NCCAS adaptation interventions for the period 2021 to 2030. South Africa regards local government to play a key role and the forestry sector is chosen as one of the priority sectors according to Goal 3. The efforts to be done under the Goal 3 that are relevant to this TA are as follows.

- (1) Developing early warning, vulnerability and adaptation monitoring system.
- (2) Promoting research and development in application, localization, transfer and adoption of technology within key climate-sensitive sectors.
- (3) Improving understanding of climate change impacts.

National Development Plan 2030 Our Future-make it work (2010)

- Chapter 5 Ensuring environmental sustainability and an equitable transition to a low-carbon economy.

Vision 2030 of the chapter includes investment in more sustainable technologies and programmes to conserve and rehabilitate ecosystems and biodiversity assets. For the transition, strategic planning is needed to response to emerging risk and opportunity, and to identify and manage trade-offs. In terms of accountability and transparency, the importance of managing, monitoring, verification and report is highlighted. The forestry sector is regarded as a carbon sink with significant potential and regional sequestration initiatives are regarded to facilitate forestry as a carbon sink. It was clearly stated that

South Africa will try to expand the forestry sector and to re-establish natural plant cover in areas such as the thicket biome.

National Climate Change Adaptation Strategy – 2020

- Intervention 1: Reduce human, economic, environmental, physical and ecological infrastructure vulnerability and build adaptive capacity.

It is stated that the NCCAS forms the basis for meeting South Africa’s adaptation commitments outlined in the NDC. The actions which are under Intervention 1 are related with this TA project are as follows.

- (1) Supporting the integration of climate-smart and ecosystem-based approaches in forestry practices.
- (2) Protecting and conserving South Africa’s most vulnerable ecosystems, landscapes and wildlife, and monitoring and controlling the spread of alien invasive species.
- (3) Promoting the expansion of tree cover, forests and forest plantations in order to maintain the production of wood raw materials, and help reducing temperatures in cities, amongst other benefits.

8. Linkages to relevant parallel on-going activities:

Please identify relevant previous and ongoing public and private sector initiatives, projects or programmes that the CTCN assistance will specifically build on and contribute to. To the extent possible, please add practical and operational details on the linkages between existing activities and the CTCN assistance. (maximum 2500 characters including spaces)

City of Mbombela Climate Change Strategy – 2018

City of Mbombela Environmental Management Framework – 2021

According to COM, the municipality has been planting trees in the rural townships including new settlements established such as RDP housing projects. This has been done in conjunction with the Department of Environment, Forestry & Fisheries (DFFE). These are community-based projects where community members are used to implement the project with the COM and DFFE overseeing & guiding the projects. The community members are paid a stipend for this work.

The invader species control program usually takes place in wetlands. It removes alien vegetation and plants indigenous vegetation. By doing so, this program contributes on saving water resource and enhancing biodiversity. And it leads to improved ecological infrastructure by reducing disaster risk and increasing climate resilience.

9. Anticipated follow up activities after this technical assistance is completed:

Please describe the expected future use of the outputs and deliveries produced by this technical assistance, after the CTCN implementation is completed, towards contributing to the anticipated impacts over time articulated in section 6. For example, what organizations or stakeholders will use the outputs of the technical assistance after it is completed, for what purpose, at what scale and scope the outputs and deliveries will be applied, when and what will be the next steps undertaken, etc. (maximum 2500 characters including spaces)

The technical outputs and deliveries from this project are expected to have a significant and widespread impact in various sectors listed below:

- (1) Environmental and Forest Management Organizations: These organizations may utilize tree



analysis, monitoring, and planning system for sustainable forest management. The outputs will include LiDAR or RGB scanning of forest, tree species identification, growth monitoring, and environmental impact assessments. The ability to accurately monitor and manage forest resources will be crucial in preserving biodiversity and ecosystems.

(2) Urban Planning and Development Agencies: The scanning data gathered will create a digital twin model of trees in Mbombela. Combined with the monitoring and management system, the data and the system may be used for urban green space planning. Cities can integrate this information for better management of urban trees, enhancing carbon storage and urban air quality, and contributing to environmental sustainability.

(3) Climate Change Research and Mitigation Initiatives: The system’s ability to estimate tree biomass and carbon storage makes it a valuable tool for climate change research. It can aid in calculating the carbon sequestration potential of natural and urban forests in Mbombela.

(4) Educational and Research Institutions: The methodologies and data gathered can be used for academic purposes, providing a rich resource for students and researchers in the fields of forestry, remote sensing, machine learning, and Geographic Information System (GIS).

10. Gender and co-benefits:

<p>Imbedded in design of the activities:</p>	<p><i>A gender mainstreaming analysis is mandatory to include for all technical assistances. A gender expert will be assigned to carry out an assessment and evaluation regarding gender mainstreaming during the implementation of the TA.</i></p> <p><i>In addition, please describe all support to gender aspects, women’s equality and other co-benefits embedded into the Response Plan (please include a reference to the actual activities and outputs as described in section 3).</i></p> <p>Gender mainstreaming activities will be integrated throughout the project. A fair gender representation in the multi-stakeholder working group, as well as in consultative meetings will be ensured in order to ensure mapping of specific needs of women in terms of tree monitoring and management. These aspects will be integrated in the development of the tree monitoring system and tree management plan.</p>
<p>Gender and co-benefits intended as result of the activities:</p>	<p><i>Please describe all gender aspects, women’s equality and other co-benefits expected as a result of the CTCN technical assistance.</i></p> <p>The City of Mbombela is 70% rural and most of its households are female-headed. The food gardens around the city are owned and managed by women. These are direct beneficiaries of the tree planting program as they are paid stipends to plant trees. The benefits are cross-cutting such as Biodiversity, Economic, Social and food provision regarding fruit trees. In addition, the cultural aspect is covered through indigenous knowledge, which they share with the project team about the types of species they require, the rationale, and their general observations of tree species change over the years.</p> <p>Also by developing the individual tree monitoring system, the basis for calculating carbon credits produced from forest’s of the City of Mbombela. This will encourage protecting and effectively managing the forests which will lead to enhancement of livelihood of the families living in the city.</p>

11. **Main in-country stakeholders in implementation of the technical assistance activities:**
Using the table below, please list and describe the role of in-country stakeholders, participants and beneficiaries who will be involved in or directly consulted during implementation of the assistance.

In country stakeholder	Role in implementation of the technical assistance
University of Mpumalanga	Supply researchers with local knowledge.
City of Mbombela	End User, Supply of local data. Project steering.
Department of Forestry, Fisheries and the Environment	Request as required.
South African National Biodiversity Institute	Request as required

12. **SDG Contributions:**

Instructions: Please complete the grey section below for a maximum of three SDGs that will be advanced through this TA. A complete list of SDGs and their targets is available here:

<https://sustainabledevelopment.un.org/partnership/register/>.

Goal	Sustainable Development Goal	Direct contribution from CTCN TA (1 sentence for top 1-3 SDGs)
1	End poverty in all its forms everywhere	
2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture	
3	Ensure healthy lives and promote well-being for all at all ages	
4	Ensure inclusive and equitable quality education and promote life-long learning opportunities for all	
5	Achieve gender equality and empower all women and girls	
6	Ensure availability and sustainable management of water and sanitation for all	
7	Ensure access to affordable, reliable, sustainable, and modern energy for all (consider adding targets for 7)	
	7.1 - By 2030, ensure universal access to affordable, reliable and modern energy services	
	7.2 - By 2030, increase substantially the share of renewable energy in the global energy mix	
	7.3 - By 2030, double the global rate of improvement in energy efficiency	
	7.a - By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	
	7.b - By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support	
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	
10	Reduce inequality within and among countries	
11	Make cities and human settlements inclusive, safe, resilient and sustainable	
12	Ensure sustainable consumption and production patterns	
13	Take urgent action to combat climate change and its impacts	<i>All TAs should indicate relevance to Goal 13 and</i>

		<i>at least one target below (13.1 to 13.b).</i>
	13.1 - Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	
	13.2 - Integrate climate change measures into national policies, strategies and planning	A system will be developed which will help policy decision-makers and stakeholders to consider climate change when making forest management plans.
	13.3 - Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	
	13.a - Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	
	13.b - Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities	By monitoring their forest and suggesting optimal strategies, local landowners' capacity to adapt to climate change will be enhanced.
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	
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	Individual tree monitoring will make systematic planning easier and lead to sustainable use and managing of their forests and plantations.
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels	
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development	Through the course of developing outcomes, an active cooperation between the Republic of Korea and Republic of South Africa is expected. The partnership between the two countries for sustainable development will be strengthened.

13. Classification of technical assistance:

Please indicate primary type of technical assistance. Optional: If desired, indicate secondary type of technical assistance.

<i>Please tick off the relevant boxes below</i>	<i>Primary</i>	<i>Secondary</i>
<input type="checkbox"/> 1. Decision-making tools and/or information provision	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 2. Sectoral roadmaps and strategies	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 3. Recommendations for law, policy and regulations	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 4. Financing facilitation	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 5. Private sector engagement and market creation	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 6. Research and development of technologies	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> 7. Feasibility of technology options	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 8. Piloting and deployment of technologies in local conditions	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> 9. Technology identification and prioritisation	<input type="checkbox"/>	<input type="checkbox"/>

Please note that all CTCN technical assistance contributes to strengthening the capacity of in country actors.

14. Monitoring and Evaluation process

Upon contracting of the implementing partners to implement this Response Plan, the lead implementer will produce a monitoring and evaluation plan for the technical assistance. The



monitoring and evaluation plan must include specific, measurable, achievable, relevant, and time-bound indicators that will be used to monitor and evaluate the timeliness and appropriateness of the implementation. The CTCN Technology Manager responsible for the technical assistance will monitor the timeliness and appropriateness of the Response Plan implementation. Upon completion of all activities and outputs, evaluation forms will be completed by the (i) NDE about overall satisfaction level with the technical assistance service provided; (ii) the Lead Implementer about the knowledge and learning gained through delivery of technical assistance; and (iii) the CTCN Director about timeliness and appropriateness of the delivery of the activities and outputs.