

Country	Kingdom of Eswatini
Request ID#	2020000001
Title	<i>Strengthening the National Disaster Management Agency's (NDMA) capacity in application of UAV and remote sensing technology for vulnerability assessments and response planning to enhance national food security and climate resilience</i>
NDE	<i>Mr. Bafana Simelane Instrument Engineer Department of Meteorology, Ministry of Tourism and Environmental Affairs bafanasim@gmail.com P.O. Box 2652, Mbabane, Eswatini</i>
Proponent	<i>Russell Dlamini Chief Executive Officer The National Disaster Management Agency (NDMA) of Eswatini russell@ndma.org.sz</i>

Summary of the CTCN technical assistance

The Kingdom of Eswatini is experiencing an upward trend in mean annual temperature across the different parts of the country, as well as increased drought and flood incidences¹. Coupled with an increase in pests and diseases² and exacerbated by unemployment and increasing food commodity prices, major constraints have been placed on food security. In 2015/16 the country experienced droughts amounting to a loss of approximately 7% of GDP, and about 18% of the government's expenditure.³ The country's vulnerability assessment information still relies on pre-planting and postharvest assessments, and oftentimes the annual National Agricultural Survey which aims to provide information on cropped area through questionnaires and field surveys is not consistently conducted due to resource and technology constraints. As a result, the country lacks continuous crop growth monitoring and assessment tools and technologies for quick and early detection of undesirable threats and occurrence of risks and hazards to food security. With Unmanned Aerial Vehicles (UAV) technology, it is expected that such assessments can be done with minimal human resources and during any phase of crop growth in order to deliver timely interventions.

The National Disaster Management Agency (NDMA) as well as the National Designated Entity of Eswatini has requested support for technical assistance from the CTCN with the overall objective to strengthen Eswatini's climate resilience, disaster risk reduction and vulnerability assessments in the agricultural sector by building capacity on access to and application of meteorological data, UAV technology and remotely sensed imagery for crop monitoring and early warning systems. The technical assistance aims i) enhance the capacity of national stakeholders, including the National Disaster Management Agency, on the application of meteorological data, UAV technology and remotely sensed imagery for crop monitoring and provision of timely early warning data to farmers ii) make available a set of baseline data for agricultural indicators in support of vulnerability

¹ <https://unfccc.int/sites/default/files/resource/swznc3.pdf>

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<https://www.tandfonline.com/doi/abs/10.1080/20421338.2016.1219503?scroll=top&needAccess=true&journalCode=rajs20>

³ <https://media.africaportal.org/documents/Drought-Policy-Brief.pdf>

assessments and decision-making, and iii) improve the country's readiness to seek GCF funding for up-scaling of technologies.

The technical assistance is expected to strengthen the country's capacity to identify, plan for and respond to climate-induced vulnerabilities and food insecurity situation in the country. It will allow for more effective data management and decision making around vulnerability assessment, food security and response, and enhance the use of climate information to increase resilience to broader climate change impacts and shocks for the 200,000 persons experiencing acute food insecurity in the country.

Agreement:

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

**National Designated Entity to the UNFCCC
Technology Mechanism**

Name: Mr. Bafana Simelane

Title: Instrument Engineer

Date: 22/09/2020

Signature: 

Proponent (signature of the Proponent is optional)

Name: Russell Dlamini

Title: Chief Executive Officer

Date: 16/9/20


Signature: 


UNFCCC Climate Technology Centre and Network (CTCN)

Name: Rose Mwebaza

Title: CTCN Director

Date: 22/09/2020

Signature: 

1. Background and context

The landlocked Kingdom of Eswatini is increasingly vulnerable to the impacts of climate change due to an upward trend in mean annual temperature across the country, as well as extreme weather events such as droughts, bush fires, storms and floods becoming more severe and frequent. As a result of these recurrent shocks, the country's food security and water resources are under threat. Eswatini also faces numerous interlinked challenges such as invasive plants and diseases, HIV/AIDS and poverty which erode the population's ability to recover and remain resilient towards climate change effects. The agricultural sector is a critical component of the economy and contributes approximately 9.5% of the country's GDP.⁴ In 2015/16 the country declared a national state of emergency due to drought, and experienced losses amounting to approximately 7% of GDP, and about 18% of the government's expenditure.⁵

As projections expect continued uncertain rainfall patterns and warmer climate, it is imperative that farming and agricultural communities adapt their practices to climate change and extreme weather events to decrease the vulnerability of rural livelihoods, where women head 48% of the households. As an example, maize production dropped by 67% in the 2015/16 El Niño-induced droughts, and it is predicted that the Highveld region will be unsuitable for growing maize by the year 2050.⁶ According to the 2019 Annual Vulnerability Assessment and Analysis Report, a recent 15% decline in cereal production coupled with increased food prices and unemployment has resulted in a 66% increase in food insecurity among the population.⁷

The Kingdom of Eswatini faces technology and capacity constraints for continuous crop growth monitoring and lacks assessment tools and technologies for quick and early detection of undesirable threats and occurrence of risks and hazards to food security. It is now looking towards emerging ICT technologies such as Unmanned Aerial Vehicles (UAV) and remote sensing for improved decision-making and planning. The National Disaster Management Agency (NDMA) is the principal institution for disaster management. The NDMA has purchased a drone, however it needs to build its capacity to undertake crop monitoring and provide timely early warning based on data from UAV and remote sensing to farmers in order to identify, plan for and respond to climate-induced vulnerabilities and food insecurity, hence this request for technical assistance.

2. Problem statement

The Kingdom of Eswatini relies on pre-planting and postharvest assessments and oftentimes the annual National Agricultural Survey which aims to provide information on cropped area through questionnaires and field surveys is not consistently conducted due to resource and technology constraints. As a result, the country lacks continuous crop growth monitoring and assessment tools and technologies for quick and early detection of undesirable threats and occurrence of risks and hazards to food security. With Unmanned Aerial Vehicles (UAV) technology, it is expected that such assessments can be done with minimal human resources and during any phase of crop growth to deliver timely interventions. The National Disaster Management Agency (NDMA), as the principal institution for Disaster Management, has already purchased a drone. However, it needs to build its financial and technical capacity with UAV technology and remote sensing to undertake crop

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<https://info.undp.org/docs/pdc/Documents/SWZ/Swaziland%20Climate%20Change%20Policy%202016%20Final.pdf>

⁵ <https://media.africaportal.org/documents/Drought-Policy-Brief.pdf>

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<https://info.undp.org/docs/pdc/Documents/SWZ/Swaziland%20Climate%20Change%20Policy%202016%20Final.pdf>

⁷ <https://reliefweb.int/sites/reliefweb.int/files/resources/2019%20ESWATINI%20VAC%20REPORT.pdf>



monitoring, vulnerability assessments and provide timely early warning information to farmers. It also faces financial barrier towards acquiring further equipment, high resolution satellite imagery and capacity building, for which this technical assistance will also build the country's readiness to seek GCF funding.

The Regional Centre for Mapping of Resources for Development (RCMRD) has been selected to implement this technical assistance based on RCMRD's expertise and proven track record of facilitating trainings and generating, applying and disseminating geoinformation technologies in Africa. RCMRD is an inter-governmental organization with 20 Member States in the Eastern and Southern Africa, including the Kingdom of Eswatini. It has a long-standing, and proven expertise in conducting the necessary research and training related to natural resource assessments in Africa using surveying, mapping, remote sensing, UAV technology and GIS.

3. Logical Framework for the CTCN Technical Assistance:

(Guidance: Please note that multiple activities lead to one Output, and multiple Outputs lead to one Outcome. There can be several Outputs, but only one Outcome description capturing the CTCN technical assistance. Deliverables are the products or services to be delivered to the NDE/Proponent/CTCN based on the Activities and the Outputs.)

	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Objective: Strengthen Eswatini's climate resilience in the agricultural sector, specifically with regard to disaster risk reduction and vulnerability assessments in the agricultural sector												
Outcome: The main outcomes include i) enhanced capacity of national stakeholders, including the National Disaster Management Agency, on the application of UAV technology and remotely sensed imagery for crop monitoring and provision of timely early warning data to farmers ii) availability of baseline dataset based on pilot application of UAV and remote sensing in the agricultural sector iii) improved readiness to seek GCF funding for up-scaling of technologies												
Output 1: Development of implementation planning and communication documents												
Activity 1: Prepare and finalize mandatory implementation planning and communication documents	X											X
i) A detailed work plan of all activities, deliveries, outputs, deadlines and responsible persons/organisations and detailed budget to implement the Response Plan. The detailed work plan and budget must be based directly on this Response Plan;												
ii) A monitoring and evaluation (M&E) plan and impact statement form with specific, measurable, achievable, relevant, and time-bound indicators identified to monitor and evaluate the timeliness and appropriateness of the implementation as well as an impact description to be updated/revised once the technical assistance is fully delivered (please refer to section 14 in the Response Plan);												
iii) A Closure Report completed at the end of the technical assistance.												
Deliverable 1:	D ₁	D ₂										D ₃
D ₁) Detailed work plan												
D ₂) M&E Plan and Impact Statement Form												
D ₃) Closure Report												
Output 2: Structured stakeholder engagement												
Activity 2.1: Identification and outreach to key stakeholders for engagement	X											
Working closely with the NDE and NDMA, relevant stakeholders will be identified and invited to an												

<p>inception workshop with the purpose of selecting key parameters as well as discussing a framework for vulnerability assessments using UAV and satellite imagery, as well as the application of meteorological data. The workshop will include representatives from the NDMA, Ministry of Agriculture, Eswatini Meteorological Service, Central Statistical Office, local authorities, academia and civil society. Civil society organizations could be selected from among the organizations trained in the CTCN technical assistance on “building capacity for climate change science” (reference nr. 2016000060). With reference to the CTCN gender mainstreaming guidelines, it is suggested that the Woman Farmer Foundation or a similar organization is included in the stakeholder workshop to represent women farmers and interests.</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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<p>Activity 3.1: Flight mission for testing of identified parameters A flight mission with the UAV drone purchased by the Kingdom of Eswatini (DJI Phantom 4) to study the prospects and feasibility for monitoring crop area (soil and field analysis), crop health, nitrogen status, biophysical, livestock sensors, stock monitoring and identification to minimize theft and other parameters identified during the stakeholder workshop (Activity 2.3). If deemed necessary, an external drone will be commissioned from the Kenya Red Cross Society.</p>	<p>Activity 3.2: Development of technical specifications Based on identified data needs and parameters for crop monitoring, as well as results from the flight mission (Activity 3.1), recommendations will be provided to the NDMA with technical specifications for the type of UAV technology, sensors, software and remote sensing services appropriate for the Kingdom of Eswatini.</p>	<p>Activity 3.3: Development of a framework for vulnerability assessments using UAV and remote sensing technologies in agriculture A framework and methodology for application of meteorological data, UAV technology and remote sensing in agriculture in Eswatini based on results from the stakeholder workshop and initial flight mission. This activity will be complemented by a desktop study and include, <i>inter alia</i>:</p> <ul style="list-style-type: none"> • Parameters and indicators which are feasible to capture with UAV technology as well as through satellite imagery, in a local context; • Design of UAV flight paths and the use of sensors; • Methodology for data collection, storage (e.g. cloud data centers), interpretation and conversion to digital maps; • Methodology for interpretation of satellite imagery data; • Integration of meteorological data in agricultural vulnerability assessments and recommendations for improved collection and access to data; • Protocols for data collection (including frequency, monitoring schemes, roles and responsibilities, coordinates, means of verification); • Protocols for data interpretation and local dissemination, as well as their use as basis for decision-making and planning • Accessibility and acceptability of technology on a local and community level <p>While the framework document will be drafted before the training in Activity 4.2, it will be finalized after the training as interaction with key stakeholders may provide valuable input to the document. The document will be made available in English.</p>	X	X	X			X																		
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	D ₁								D ₂
<p>Deliverables 3: D₁) Technical specifications for UAV and remote sensing D₂) Framework document for application of meteorological data, UAV technology and remote sensing in agriculture</p>									
<p>Output 4: Training on UAV and remote sensing technologies</p>									
<p>Activity 4.1: Identification of training participants and development of training materials Minimum 15 course participants. Participants and training topics will be selected together with the NDE and NDMA based on capacity needs identified through the stakeholder workshop as well as framework developed in Activity 3.3.</p>									
<p>Activity 4.2: Facilitation of a 5-day training on UAV and remote sensing technologies The training will build the capacity of the national stakeholders to apply the framework, methodologies and protocols for UAV and remote sensing developed through this technical assistance. Envisaged components also include:</p> <ul style="list-style-type: none"> • UAV technology and land surveying: practical training on operating UAV's and acquiring and interpreting spatial agricultural data for production of quality thematic maps; • Remote sensing: how to perform remote sensing analysis on relevant satellite images; • Meteorological data: how to improve collection, access and application of meteorological data for agricultural vulnerability assessments; • South-South knowledge/experience sharing: a representative from Mozambique's National Institute of Disaster Management (INCG) may be invited to share the country's experiences with developing their UAS teams and coordination cells, and application of UAS technology flood tracking during the 2019 cyclone. Eswatini's NDMA and Mozambique's INCG have previously collaborated on UAV training and regional knowledge transfer has been requested as part of this technical assistance. 									
<p>Deliverables 4: D₁) Agenda and course material for a training on application of meteorological data, UAV technology and remote sensing. D₂) Training feedback form (template to be provided by the CTCN) D₃) Training report summarizing key discussions, outcomes and new learnings related to application of UAV and remote sensing technologies for vulnerability assessments and disaster risk management</p>									

D1) GCF Readiness Proposal

4. Resources required and itemized budget:

Please provide an indicative overview of the resources required and itemized budget required to implement the CTCN technical assistance, including for M&E-related activities, using the table below. Important to note that minimum 1% of the budget should explicitly target gender specific activities related to the technical assistance (please see section 10 for further information on gender). Once the Response Plan is completed, a Response Implementation partner(s) will be selected by the Climate Technology Centre (CTC). A detailed activity-based budget for the CTCN assistance will be finalized by the CTCN and selected Implementer.

Activities and Outputs	Input: Human Resources (Title, role, estimated number of days)	Input: Travel (Purpose, national vs. international, number of days)	Inputs: Meetings/events (Meeting title, number of participants, number of days)	Input: Equipment/Material (Item, purpose, buy/rent, quantity)	Estimated cost	
					Minimum	Maximum
Output 1: Development of implementation planning and communication documents	1 mid-level expert 10-15 working days @ USD 450-550 per day	N/A	N/A	N/A	USD 5,000	USD 9,000
Output 2: Structured stakeholder engagement meeting	<ul style="list-style-type: none"> 2 mid-level GIS/remote sensing experts 10-15 working days @ USD 	2-day travel and logistic support for 2 international experts for facilitation of in-country workshop	<ul style="list-style-type: none"> 1-day inception workshop 10-20 participants 	N/A	USD 11,000	USD 18,500

	<p>450-550 per day</p>	<p>(+ USD 2,000)</p>	<p>N/A</p>	<p>N/A</p>	<p>USD 53,000</p>	<p>USD 64,500</p>
<p>Output 3: Framework and methodology for vulnerability assessments</p>	<ul style="list-style-type: none"> • 1 mid-level GIS/remote sensing experts 10-15 working days @ USD 450-550 per day • 2 senior-level GIS/remote sensing experts 20 working days @ USD 550-650 per day • at least 1% of total budget will be allocated towards hiring a gender expert to conduct a gender analysis to be embedded in the framework document for vulnerability 	<p>N/A</p>	<p>N/A</p>	<p>Commissioning of drone(s) for flight mission for testing of identified parameters, as well as for use in Output 5: Collection of baseline data</p>	<p>USD 53,000</p>	<p>USD 64,500</p>

	<i>assessments</i>							
Output 4: Training on UAV and remote sensing technologies	<ul style="list-style-type: none"> 2 senior-level GIS/remote sensing experts 20-25 working days @ USD 550-650 per day 	10-day travel and logistic support for 2 international experts for facilitation of in-country workshop (+USD 10,000)	5-7 day in-country training (logistical support)	Potential renting of UAV equipment	USD 32,000	42,500		
Output 5: Collection of pilot baseline data and development of case study	<ul style="list-style-type: none"> 2 senior-level GIS/remote sensing experts 5 working days @ USD 550-650 per day 	No additional travel required. Activity to be undertaken in conjunction with Output 4.	N/A	N/A	USD 2,750	USD 3,250		
Output 6: Support for identifying financing opportunities to create enabling environment to upscale deployment and use of UAV and remote sensing technologies	<ul style="list-style-type: none"> 2 mid-level GIS/remote sensing experts 10-15 working days @ USD 450-550 per day 	N/A	N/A	N/A	USD 9,000	USD 16,500		
Estimated range of costing for the entire Response Plan								
					USD 112,750	USD 154,250		

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
UAS/UAV Specialist	<p>At least a Master's degree (or equivalent experience) in a relevant discipline; Expertise areas: UAS systems, UAV technology, data collection and processing; Minimum 3-years relevant experience Language requirements: English. Swazi is an advantage Understanding and/or experience working with Sub-Saharan African countries</p>
GIS and Remote Sensing Expert/Geospatial Analyst	<p>At least a Master's degree (or equivalent experience) in a relevant discipline; Expertise areas: Geographic Information Systems, remote sensing, geospatial agricultural monitoring Minimum 7-years relevant experience Language requirements: English. SiSwati is an advantage; Understanding and/or experience working with Sub-Saharan African countries</p>
Surveyor	<p>At least a Master's degree (or equivalent experience) in a relevant discipline; Expertise areas: agricultural surveying, mapping Minimum 5-years relevant experience Language requirements: English. Swazi is an advantage Understanding and/or experience working with Sub-Saharan African countries</p>
Coordinator/workshop facilitator/project manager	<p>At least a Master's degree (or equivalent experience) in a relevant discipline; Expertise areas: climate resilience, education, experience with drafting proposals for organisations such as the GCF Minimum 5-years relevant experience Language requirements: English. Swazi is an advantage Understanding and/or experience working with Sub-Saharan African countries</p>

6. Intended contribution to impact over time

UAV's may provide regular field overviews and crop assessment for faster response such as exact planning of pests and disease treatments, and yield higher outcomes compared to conventional methods of assessment related to time, accuracy, safety, costs and yield maximization. They have the advantage of flexible and convenient operation, on-demand access to data and high spatial resolution allowing for appropriate analysis of crop health and status. This technical assistance will contribute positively to the capacity of the Kingdom of Eswatini to uptake modern technologies such as remote sensing and UAV for more cost-effective and accurate analysis of vulnerabilities. This will in turn have a positive impact on timely planning, decision-making and interventions to reduce yield losses and increase productivity in the agriculture sector, ultimately contributing positively to the livelihoods and health of farmers and communities.

By developing a GCF Readiness Proposal, this technical assistance will further help facilitate access to larger scale climate funding in order to accelerate a widespread application of the technologies on a national level with a potential positive impact on the 200,000 people suffering acute food insecurity in the Kingdom of Eswatini, through more reliant and timely vulnerability assessment in the agricultural sector.

7. Relevance to NDCs and other national priorities

This technical assistance is in alignment with the intensions of the **National Disaster Resilience Strategy** to enhance national resilience and improve food security. Furthermore, the Government of Eswatini has developed a **National Climate Change Policy and the National Climate Change Strategy and Action Plan (NCCSAP)** in 2016, where agricultural sector and the need to address its vulnerabilities are stated. The NCCSAP intends to integrate disaster preparedness through early warning and monitoring hotspots within an integrated disaster risk management (DRM) framework, combining climate change adaptation (CCA), disaster risk reduction (DRR).

Moreover, the country's **Nationally Determined Contributions (NDC)** also highlights the need to reduce vulnerability to climate change through strengthening early warning systems and disaster risk management, including in agriculture and water sectors. This technical assistance aims to strengthen NDMA's institutional capacity to identify, plan for and respond to climate-induced vulnerabilities and food insecurity situation in the country. It will allow for more effective data management and decision making around vulnerability assessment, food security and response, and enhance the use of climate information to increase resilience to broader climate change impacts and shocks.

Other national policies, strategies and plans to which this technical assistance aligns with include:

- **Technology Needs Assessment (report I on climate change adaptation⁸):** recognized agriculture and food security, as well as natural hazards and preparedness (e.g. drought) as priority sectors affected by climate change. The TNA also states that "mainstreaming disaster risk reduction into national planning processes, enhancing early warning systems and building resilience in every sector is imperative."
- **Eswatini Disaster Risk Reduction National Action Plan (2017-2021):** "Undertake risk mapping and analysis to identify areas prone to disasters and determine appropriate response measures" in the agriculture and food security sectors
- **The National Disaster Risk Management Policy (2011)**
- **Eswatini National Multi-Hazard Contingency Plan (2018-2019):** the technical assistance

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https://unfccc.int/ttclear/misc/_StaticFiles/gnwoerk_static/TNA_key_doc/0f4a817d7bdc434b8c50090a009d3afc/e19292b7ab21419aa4251e0d1205edfd.pdf

can aid in the implementation of the Multi-Hazard Contingency Plan by providing timely and relevant information for fast relief work and risk mapping.

- **Disaster Management Act 2006** in which the development of an integrated, coordinated and adequately financed national disaster management system aimed at decreasing vulnerability and increasing mitigation and response capacity shall be supported, for example by focusing on strengthening national and local capacities for disaster management, emphasizing development of institutional structures, voluntarism, education, training etc.
- **The Kingdom of Eswatini’s Strategic Roadmap (2019-2023)** and its medium-to long-term goal to conduct a land use study and develop an integrated land use strategy.

8. Linkages to relevant parallel on-going activities:

This technical assistance will build on previous and ongoing relevant activities, including Eswatini’s own efforts in vulnerability assessments and agricultural analysis. A Vulnerability Assessment and Analysis (VAA) is performed annually by the Vulnerability Assessment Committee (VAC) and other stakeholders to determine the vulnerability status of households using a multi-sector approach that addresses food security, agriculture, health, nutrition and education. It is a survey undertaken between May and June during the post-harvest period which covers 2,000 households and includes focus group discussions. The VAA is partly supported by the SADC Regional Vulnerability Assessment and Analysis (SADC RVAA) Programme. In addition, an annual National Agricultural Survey is conducted in collaboration with the Central Statistical Office to provide information on cropped area through questionnaires and field surveys. It focuses on area measurements and is not consistently conducted due to resource and technology constraints. With UAV technology, such assessments are expected to be undertaken at more regular intervals and not only postharvest. With the capacities built through this technical assistance, NDMA staff, volunteers and other stakeholders could perform assessments during any phase of crop growth for timely interventions using minimal human resources.

There are other previous or on-going activities related to vulnerability assessments and crop monitoring. In early 2020, the World Bank in collaboration with the NDMA hosted a series of workshops aimed at strengthening Eswatini’s institutional capacities and understanding of drought preparedness and Disaster Risk Management (DRM) through the ACP-EU Natural Disaster Risk Reduction Program. The program further aims to foster the development of a drought monitoring and early warning system, and develop pilot drought contingency plans, which could potentially be linked with this technical assistance.⁹

Previous training on UAV technology and Unmanned Aircraft Systems (UAS)¹⁰ has been provided in 2018 when representatives from the Eswatini NDMA were invited to join a component of a UAS training series called ‘Let’s MAP’ organized by the World Food Programme, the global lead of the Emergency Telecommunications Cluster (ETC). NDMA representatives were invited by Mozambique’s National Institute of Disaster Management (INCG), which hosted and coordinated the learning experience. The training focused on topics including crop monitoring and data processing, safety procedures, usage in varying weather conditions, and the importance of building community acceptance and engagement for UAS activities. The INGC in Mozambique is now assisting other governments within the region to develop their own UAS teams and coordination cells, creating an opportunity for South-South knowledge sharing.

⁹ <https://www.gfdr.org/en/eswatini-drought-preparedness>

¹⁰ “Unmanned aircraft systems” refers to the entire system required for advanced drone operations including the aircraft, ground control station, and communications system. Any UAS includes a UAV as the aircraft component of the system.

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

The technical assistance will lead to several deliverables that are critical to an improved disaster risk management and vulnerability assessments in the agriculture sector. The National Disaster Management Agency (NDMA) and relevant stakeholders will receive training which will enable them to follow up on the processes, protocols and recommendations provided in the Framework and methodology for vulnerability assessments using UAV technology and remotes sensing delivered through this technical assistance (Activity 3.3).

Additionally, follow-up activities by the NDMA and relevant Ministries will be:

- Stakeholder validation workshop with at least the same stakeholders as during the inception workshop to present and discuss the findings of this technical assistance and identify upcoming activities, further capacity gaps and next steps
- Regular field and crop assessments and monitoring of cropped areas using available drones for the development of yield estimation models for food security and early warnings
- Pilot precision farming and application of drones for improved crop yield
- Application of drones for livestock monitoring
- Leveraging large-scale funding via development of GCF readiness proposal
- An assessment of the need to complement existing drones with suitable drones for the identified needs based on the technical specifications (Activity 3.2) for the type of UAV technology, sensors, software's and remote sensing services appropriate for the Kingdom of Eswatini.

If the technical assistance is successful in leveraging large-scale funding via development of a GCF Readiness Proposal (Activity 6.1) and the recommendations and trainings provided by this technical assistance, the NDMA and relevant Ministries will oversee the up-scaling and implementation of integrated vulnerability assessments and disaster risk reduction on a national level with the use of UAV technology and remote sensing.

10. Gender and co-benefits:

<p>Embedded in design of the activities:</p>	<p>The services of a gender expert will be utilized to carry out a gender analysis during implementation of the technical assistance, with a particular focus on women's climate vulnerabilities and their role as active agents and farmers in strengthening climate resilience through their contribution to disaster risk reduction, vulnerability assessments and crop monitoring. The technologies that will be supported with this technical assistance include UAV and remote sensing. The gender analysis will pay attention to potential opportunities and threats, as well as access to the technologies from a gender perspective.</p> <p>In addition, activities in support of gender mainstreaming embedded in the Response Plan outputs and activities (see section 3) include:</p> <ul style="list-style-type: none"> • Output 1 - Development of implementation planning and communication documents: the detailed workplan, M&E plan and Impact statement form, as well as Closure Report will integrate a gender perspective. The M&E indicators will pay attention to gathering gender-disaggregated data for workshops and trainings. • Output 2 – Design and implementation of a structured stakeholder engagement workshop: Organizations representing women farmers and stakeholders, including Eswatini's 'Woman
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	<p>Farmer Foundation’ shall be invited to the stakeholder engagement workshop to support development of framework and methodology for the technical assistance and training, and particular attention will be paid to gathering gender-disaggregated data throughout implementation. Furthermore, efforts will be made to ensure gender parity among workshop participants to the extent possible.</p> <ul style="list-style-type: none"> • Output 3 – Framework and methodology for vulnerability assessments: at least 1% of the budget will be allocated towards hiring a gender expert to conduct a gender analysis to be embedded in the framework document for vulnerability assessments • Output 4: Training on UAV and remote sensing technologies: Efforts will be made to ensure gender parity among workshop participants to the extent possible. • Output 5 – Collection of pilot baseline data and development of case study: the results of the gender analysis as well as recommendations for gender mainstreaming described in the framework for methodology for vulnerability assessments (developed in Output 3) will be taken into considerations during the pilot testing of the technologies • Output 6 – GCF Readiness Support: Lessons learned from the gender analysis as well as gender-disaggregated data will be taken into consideration when developing analysis and support for GCF readiness
<p>Gender and co-benefits intended as result of the activities:</p>	<ul style="list-style-type: none"> • The activities will support provision of data and knowledge to better understand women farmers particular strengths and climate vulnerabilities in the agriculture sector. By mapping out women’s role as farmers and active agents of change, areas of intervention may be identified to strengthen women’s climate resilience and enhance their contribution to disaster risk reduction, vulnerability assessments and crop monitoring. • The project will build capacity of NDMA staff to undertake crop monitoring and assessments, which will help support both male and female farmers. • The expected outcome includes enhanced early warning, which will support farmers with increased crop yields and reduced losses, ultimately promoting food security and strengthened livelihoods for the benefit of both men, women and children in farming households.

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
National Designated Entity	The NDE will provide linkage with CTCN and support the application process.

National Disaster Management Agency (NDMA)	Proponent of the technical assistance request. NDMA's capacity to undertake crop monitoring and provide early warning will be built as a result of activities. NDMA will also liaise with other key stakeholders.
Ministry of Agriculture (Land Use Planning, Agriculture Extension Services, Soil Testing unit and Agriculture Marketing Unit)	<ul style="list-style-type: none"> To provide agricultural data, food security information and crop variants data. To provide historic agricultural information on agricultural conditions prevailing in Eswatini To act as a liaison to regional and national agriculture extension offices
Ministry of Tinkhundla and Administration	<ul style="list-style-type: none"> This entity will provide access to experimental areas to be used during implementation.
Vulnerability Assessment Committee (VAC) and the Central Statistics Office	<ul style="list-style-type: none"> To provide vulnerability assessment data, reports and other relevant statistical data To provide Enumeration Area data To collaborate with NDMA in data collection
National Meteorology Service	To provide climate data and information
Department of Meteorology	To provide climate data and information
Department of Water Affairs	To provide hydrological data and information
University of Eswatini	<ul style="list-style-type: none"> To collaborate with NDMA on research and knowledge management To provide Geographic Information System support
CANGO	CANGO is a coordinating body for NGO activities in Swaziland and can contribute to the initial stakeholder workshop.
Women Farmer Foundation	Their role will be to ensure gender mainstreaming throughout implementation from the perspective of local women farmers represented by the NGO

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	The TA will contribute to achieving food security through strengthened vulnerability assessments and response planning in the agricultural sector
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	The 2015/16 drought amounted to a loss of about 7% of Eswatini's GDP. Improved vulnerability assessment and early detection of undesirable threats and occurrence of risks and hazards to food security will contribute positively to a sustainable economic growth and sustainable livelihoods in the agricultural sector.
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	This TA will strengthen resilience and adaptive capacity to climate-related hazards and risks in the agricultural sector (13.2) as well as raise the capacity of national stakeholders to effectively plan for food security, including the perspectives of women, and affected communities (13.b).
	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	
	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	
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	
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	

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>
X 1. Decision-making tools and/or information provision	X	<input type="checkbox"/>
<input type="checkbox"/> 2. Sectoral roadmaps and strategies	<input type="checkbox"/>	<input 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 type="checkbox"/>
<input type="checkbox"/> 7. Feasibility of technology options	<input type="checkbox"/>	<input type="checkbox"/>
X 8. Piloting and deployment of technologies in local conditions	<input type="checkbox"/>	X
<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.