ADAPTATION FUND

UN environment programme | CTCN CLIMATE TECHNOLOGY CENTRE & NETWORK

Adaptation Fund Climate Innovation Accelerator

Technology concept submission form

Guidelines:

- Technology concept submission form should be completed by an applicant organisation in collaboration with the national focal points to the CTCN (National Designated Entity, NDE) and the Adaptation Fund (Designated Authority) of the country. Please see updated contact list of the NDEs and the Designated Authorities through web-links as below:
  - NDE: http://unfccc.int/ttclear/support/national-designated-entity.html
  - Designated Authority: https://www.adaptation-fund.org/apply-funding/designated-authorities/
- The form must be signed by the NDE before official submission to UNEP-CTCN.
- The form can be submitted as a Word file containing a digital signature or as a signed and scanned PDF file in combination with an un-signed Word file.
- For the technology concept submitted by multiple countries, all the NDEs of the respective countries shall sign identical forms before official submission to UNEP-CTCN.

Country or countries:	Mozambique - Zambezi Valley Region
Title of the technology concept:	Implementation of Water-Food-Energy nexus using digital technologies for local communities in Mozambique.
NDE:	**National Designated Entity:** Ministry for Science and Technology **Focal point:** Mr. Antonio Jorge Raul Uaissone **E-mail:** antonio.uaissone@mctes.gov.mz; tonyraul13@hotmail.com **Address:** Av. Patrice Lumumba, 770, Maputo, Mozambique **Telephone:** +258 843097592 **Website**: http://www.mctes.gov.mz
Applicant:	**Nome da organização:** *Agência de Desenvolvimento do Vale do Zambeze* **Focal point:** *Nelson Rodrigues António, Technical and Financial Assistance Director* **E-mail:***nelorod2006@gmail.com,* **Address:** *Tete, Av. da Liberdade nº 067,* Telephone: *+258843136792/ +258 86 4009461*

Geographical scope:
☒ Community level
☒ Sub-national
☐ National
☐ Multi-country
If the technology concept is at a sub-national or multi-country level, please describe specific geographical areas (provinces, states, countries, regions, etc.).

Due to the great potential of solar energy (see annex 1) aligned with the greater impact of the climatic events such as Cyclone Idai (2019), Ana (2021) this project will take place at Zambezi valley region specifically at Tete, Zambézia, Manica.

Problem statement related to climate change (up to one page):

Due to its geographic location, Mozambique is a country highly vulnerable to climate changes that are attributed to the long coastline, the existence of zones with altitude below sea level and inter-tropical convergence. In the period from 2018 to 2021, climate change manifests itself through extreme weather events such as Cyclone Idai (2019), Keneth (2019), Ana (2021), which caused 648 deaths, 1763 injuries, 273854 homes affected, 112 health units, 3984 classrooms destroyed, 376817 students affected and 770866 hectares of diverse crops were lost, droughts and floods associated with changes in temperature and rainfall patterns up to 279mm in 24 hours. The impact of extreme events is predicted to worsen in the future. This will affect the most vulnerable sectors which include agriculture, water resources and energy.

Future projections indicate that climate change will negatively affect productivity as a result of the deterioration of the production environment and, as a consequence, the region is highly dependent on agriculture and with a large part of the population in a situation of food insecurity.
Therefore, smart agricultural systems constitute all practices that help rural producers to restore degraded agrosystems and increase productivity, improve food security, adaptation and mitigation to climate change.

It is estimated that 80% of producers in the Central region of Mozambique, specifically in the Zambezi Valley, use motor pumps in the irrigation process, which significantly contributes to water pollution through the spillage of oils, lubricants and fuel, the equation the primary resource will be fuels. fossil fuels (charcoal and firewood) which contributes to atmospheric air pollution through the emission of greenhouse gases, without putting aside the massive use of inorganic fertilizers in the production process, with negative impacts on the environment and on the food chain of consumers. In turn, rural producers face a decline in productivity associated with seasonality of production and the lack of knowledge of integrated techniques, which translates into reduced incomes, increased greenhouse gas emissions, reduced carbon sequestration, and livelihoods are under pressure from loss of resilience.

Past and on-going efforts to address the problem (up to half a page):

Despite the various strategies and policies to reduce the adverse effects of climate change at central level, the Zambezi Valley Development Agency within the scope of the implementation of research projects by action (IPA) developed pilot initiatives from 2017 to 2021 in Modern technologies for effluent treatment and water reuse in fish farms; Use of hydraulic ram for pumping water as an alternative to the shortage of electricity and fuel in rural areas; Establishment of homemade units for the transformation of biodegradable waste into organic compounds in the suburban environment and Construction of biodigesters for the production of biogas and biofertilizers. In addition to supporting the implementation of the innovation project to increase water productivity and food security resistant to climate change in small-scale agriculture in the central region of the country (APSAN-Vale).

Specific technology[1] barriers (up to one page):

Notwithstanding the economic potential of Mozambique and the Zambezi Valley in particular, which translate into comparative and competitive advantages, the country has a high average illiteracy rate among the adult population compared to the average for the sub-Saharan region of around 53.6%, being higher in rural areas (65.7%) than in urban areas (30.3%) and more prominent in women (68%) than in men (36.7%) (IESE, 2015), this rate reduced to around 44.9% in 2015 with higher incidence in women (57.8%) compared to men in (30.1%) according to INE, which results in:

- Lack of capacity and technical knowledge for handling animal manure and other mechanisms that enable the production and/or sustainable use of renewable energies;
- Difficulty in disseminating and/or adopting sustainable technologies due to **(i)** Absence of a local budget allocated to management committees or associations to increase the efficiency of the implementation of Climate Resilience programs; **(ii)** Absence of a sustainable mechanism for the continuity of post-financing projects, **(iii)** Absence of inter-institutional coordination and an integrated vision;
- Lack of basic information (about technical, environmental, economic, financial and social feasibility) on the technology diffusion process, which supports decision-making.

Measures or efforts to overcome major barriers:

- Improved research, implementation, dissemination and adoption of innovative and sustainable technology;
- Establishment of adequate Training programs for Technicians (teachers, extension workers) of the different Sectors responsible for implementing the Technologies,
- Develop an efficient institutional mechanism, which optimizes the existing resources in the country, for the implementation of adaptation technologies.
- Prioritization and Provision of Adequate Financial Resources for different sectors and different levels of governance;
- Identification of a Financial Model that enables sustainable and continuous research as well as the Diffusion of Technologies;

Sectors:

Please indicate the main sector(s) related to the technology concept:

☒ Agriculture	☐ Coastal zone management	☐ Disaster risk reduction	☒ Food security
☐ Forests	☐ Human health	☐ Marine and fishery	☒ Rural development (resilience)
☐ Urban development (resilience)	☒ Water management		

Please add other relevant sectors:

Cross-sectoral enablers and approaches:

[1] ***"any equipment, techniques, practical knowledge and skills** needed for reducing greenhouse gas emissions and adapting to climate change" (Special Report on Technology Transfer, IPCC, 2000)*

Please indicate the main cross-sectoral enablers and approaches:

☐ Communication and awareness	☐ Economics and financial decision-making	☐ Governance and planning	☒ Community based
☐ Disaster risk reduction	☐ Ecosystems and biodiversity	☒ Gender	

Technology concept requested (up to one page):

***Overall objective*:**

- Establish intelligent units of agricultural systems for adaptation and mitigation to climate change in rural producer associations in central Mozambique (technology Hubs of sustainable production and resilient)

Anticipated groups of activities to be performed by the micro-grants projectL:

- Establishment of systems for capturing and pumping water through photovoltaic systems for integrated fish production reservoirs coupled with horticulture (Aquaponics) integrated with animal production units (cattle, swine, goats and chickens), for the production of biogas, bio fertilizers and organic compounds.
- raining of beneficiary producers and local extension agents for efficient use of intelligent units and integration in the automation process;
- Monitoring and data collection of efficient use of units for replication in other locations in the Zambezi valley nationally.

- **Collection and pumping of water through photovoltaic systems**: it will be done next to the artificial or natural water source for the integrated fish production reservoirs, by means of a pump (2Hp, flow of 500L/h and head of 20 mca), powered by photovoltaic systems with a maximum capacity of 100W. In order to make irrigation management sustainable, the system will be automated through the installation of a soil sensor module and/or 5v relay module using megatronics technology, for instance low cost Arduino Microprocessors. This will allow for availability of water for watering animals, filling fish ponds and domestic consumption.

- **Integrated reservoirs for fish production coupled with horticulture (Aquaponics)**: the circular tanks will be used for raising fish and fertigating vegetables (tomatoes, onions, peppers, cucumbers, potatoes, lettuce and green beans), thus developing, technical capacity of rural producers and extension workers on construction and management of integrated systems. Each tank will have a dimension of 7m in diameter and 1.2m in height, equivalent to a useful volume of 26 thousand liters of water and an average production capacity of 1 ton of fish (***Oreochronico Niloticus–Tilapia***), which will generate an income of around 104,000MZN/month (80% of the production) and availability of 200kg for food (20% of the production). To complete the system, circular fish tanks will receive a hydraulic ram (CH) and the respective discharge valve (VD) that will be coupled to the drip irrigation system for the renewal and drainage of water from the interior of the reservoir and to irrigate an area of 5000m^2 for vegetable production (tomatoes, peppers, cabbage, carrots) which allows the production of 9.1 tons of food and generating a revenue of 223,875.00MZN/cycle.

- ***Animal production units, production of biogas, biofertilizers and organic compounds:*** *From the animals raised by the producers, in facilities (such as goat, pen, pigsty and aviaries), built locally, the manure will be re-used to feed fish and generate biogas, biofertilizers and production of organic compounds, as a form of manure management and reduction of greenhouse gas emissions. The biodigester with a volumetric capacity of 1.5m^3 will be of the Canadian type with a hydraulic retention time of 20 to 50 days, constructed of high-density Polyethylene and a capacity of 50 m^3, and it will need about 38.4 kg/m^3 of manure. of animal, which will allow the monthly production of 576 kg of biogas with an energy power of 21Mj. With this amount of biogas, it will allow the beneficiary to prepare at least three meals a day, which generates savings around 1,600.00 mts/month. It will also have a homogenization and biofertilizer tank, a purification and moisture removal system.*

Anticipated products to be delivered by the micro-grants project: *the project of* Intelligent Agricultural Systems Focused on Adaptation and Mitigation of Climate Change *foresees the following products:*

- ***Food security*** *- production of organic food by providing 1ton of fish per cylce, 9.1tons diverse vegetables and availability of animal protein) and a revenue of 223,875.00MZN/Cycle and savings on some basic needs;*
- ***Soil and water conservation*** *– Production and use of biofertilizers promoting organic prodution and efficient irrigation system;,*
- ***Clean and renewable energies*** *- uses of photovoltaic systems and biogas production for domestic use and reduction of greenhouse gas emissions;*

The project will be placed in strategic location across the Zambezi Valley region to ensure the adoption of the technologies-solution (Technology hub) by the nearby producers/communities. For that those technologies will be set up using a low cost and accessible materials.

Expected timeframe:

18 (eighteen) months

Anticipated gender and other co-benefits from the technology concept:

Please describe the activities with gender linkages as well as the anticipated gender and other co-benefits (e.g. biodiversity, economic, social, cultural, etc.) that are likely to be generated as a result of the micro-grants project.

The activities of this project will focus on rural producer associations in the Zambezi Valley region, where, in light of the principle of gender equality expressed in article 36 of the Constitution of the Republic of Mozambique, for this project will be given a special attention to women in vulbnerable situation (Women chief of families or widows, unemployed women), for that will be:

- *Establish and guarantee the full functioning of Gender Units in the associations with the support of the gender units established in the Educational Institutions (Unizambeze, UCM, ISPM, ISPS), for that will be defined and trained a staff with a profile and skills appropriate to the attributions of the respective unit;*
- *Ensure the dissemination, monitoring, evaluation and regular reporting of the degree of implementation of the Gender Strategy and its Action Plan;*
- *Establish and publicize incentives aimed at attracting and retaining women in the association and in the technology transfer process;*

- *Focus on interventions to promote gender equality and women's empowerment in order to guarantee their full participation in the production, conservation, processing and marketing of the harvested product;*
- *Sensibilization of local communities to create community committees for sustainable management of natural resources, encouraging the participation of women in the respective structures.*

Key stakeholders:

Please list the stakeholders who will be involved in the implementation of the micro-grants project and describe their role during the implementation (for example, government agencies and ministries, academic institutions and universities, private sector, community organisations, civil society, etc.).

Stakeholders	**Role to support the implementation of the micro-grants project**
National Designated Entity	National Monitoring of the progress of the project and alignment with the nation targets in climate change.
Designated Authority	National Monitoring of the progress of the project and alignment with the nation targets in climate change.
Applicant	Local Mobilization ensuring the buy in of the project by the local and national government, financial and progress reporting, quality Check of the results achieved and correction if needed, data collection, Monitoring and evaluation
Higher Education Institutes (ISPM, Uni Zambeze)	Research and extension development, establishment of smart unit technologies, diffusion of technologies for implementation in other regions
Economic Activity Distrital Services (SDAE) - extensionitas	Support in the establishment of smart unit technologies, diffusion of technologies for implementation in other regions

Alignment with national priorities (up to 2000 characters including spaces):

The present Technology concept is consistent with Mozambique's climate priorities as, according to the **Estratégia Nacional de Adaptação e Mitigação de Mudanças Climáticas (ENAMMC) 2013-2025**, it is aligned with the need to reduce vulnerability to the impacts of Climate Change. According to this National Strategy, mitigation is already beginning to be recognized as an opportunity, with references in the Energy Strategy (carbon tax and promotion of the use of endogenous energy resources, which should promote clean and renewable sources), and the Policy on Biofuels, Biofertilizers and Organic Agricultural Products.

According to the **Gender, Environment and Climate Change Strategy**, low carbon mitigation and development constitutes an opportunity for Mozambique to get involved in global efforts to reduce GHG emissions through the definition of national mitigation priorities to promote the low carbon economy that they will depend on the ability to mobilize technological resources at affordable prices and the necessary financial resources.

According to the **Plano Estratégico para Desenvolvimento do Sector Agrário (PEDSA – 2011-2020)**, most of the priorities that have been identified for water management are addressed through the construction and rehabilitation of infrastructure (increase access and capacity to capture , storage, treatment and distribution of water, explore technologies to improve water availability, build agro-hydraulic infrastructures in the main surface courses and small, easily maintained dams for irrigation and animal drinking purposes). Also, according to this instrument, the strategic actions identified for the agriculture sector consist of increasing the resilience of agriculture and livestock through the diversification and introduction of cultures that are more resistant to the variation of climatic parameters, improving agricultural production and productivity through the availability of technologies and inputs suitable for Climate Change, develop programs and national action plan for soil conservation and nutrition (conservation agriculture), improve and expand technical assistance to producers in terms of intervention quality, promote aquaculture as an alternative means to a decrease in the quantity of fish and increased demand, improve the quality of information and the capacity of small-scale fishing, reinforce measures for the control and management of fishing activities, guaranteeing access to clean technologies in order to guarantee the renewal and maintenance of stocks.

Reference document (please include date of document)	**Extract** (please include chapter, page number, etc.). • Plano Estratégico de desenvolvimento do Sector Agrário (2020-2024), Página 8; • Estratégia Nacional de Adaptação e Mitigação de Mudanças Climáticas (ENAMMC) 2013-2025, Páginas 6-30 • A Alfabetização em Moçambique: Desafio da Educação para todos; Background paper for the Education for all global monitoring report 2006: literacy for life; 2005 (iese.ac.mz), Página 6
Nationally Determined Contribution (NDC)	*Direct alignment and contribution to NDC implementation is required. Please include a direct reference to the INDC/NDC document (chapter, page number, etc.).* *Agenda 2025 – Chapter 6.4.3.4.3 Page 112:* Agenda+2025 (1).pdf PROGRAMA QUINQUENAL DO GOVERNO (2020-2024), Chapter 4.2.8, Page – 26, PQG 2020.2024 Versao AR 02042020-min.pdf (ts.gov.mz)
Technology Needs Assessment	
National Adaptation Plans	
Add others here as relevant	

Development of the technology concept (up to 2000 characters including spaces):

A Agência do Zambeze no seu papel de promotor de Desenvolvimento do Vale Do Zambeze em parceria com a Technology University of DELFT (TU DELFT) através do Programa de

Desenvolvimento e Competências Técnico Profissionais e Empresariais - Projecto NICHE MOZ 266 implementou no período de 2017 – 2021 a componente de investigação por acção através da selecção de tópicos de pesquisa para providenciar soluções aos problemas apresentados pelo Sector Privado e comunidades locais no vale do Zambeze nas áreas de produção de fertilizante orgânico, qualidade de água, produção de combustível limpo, com recurso a equipamentos acessíveis e de baixo. As temáticas de investigação foram seleccionadas de forma competitiva através do Project Advisory Comitee (PAC- NICHE MOZ 266) composto por representantes do Governo (SDAE, DPOPHRH, DPADER, MCTES), Sector privado, Utilizadores e consumidores de recursos hídricos e foram realizados através de um processo interactivo de pesquisa que envolvia estudantes, docentes, comunidades locais e sector privado o que permitiu o uso dos dados para a produção de artigos científicos e obtenção do Grau de Licenciatura. As tecnologias foram investigadas e implementadas de forma piloto a nível do Vale do Zambeze nos distritos de Angónia e Chimoio-Vanduzi com a colaboração de instituições de ensino superior (UNIZAMBEZE, ISPM).

A luz do MOU existente entre a Agência do Vale do Zambeze e o Ministério de Ciência e Tecnologia e Ensino Superior (MCTES) para apoio desenvolvimento do processo de ensino e aprendizagem, investigação e reforço de capacidade de instituições de Ensino foi apresentado e avaliado o conceito tecnológico.

Background documents and other information relevant for the technology concept:

Estratégia Nacional de Adaptação e Mitigação de Mudanças Climáticas (2013-2025) - 1547562128-Estrategia Nacional de Adaptacao e Mitigacao das Mudancas Climaticas 2013-2025.pdf (biofund.org.mz)

Action Research topics (2017-2021) - Action research – ZAMADZI

Estratégia de Género, Ambiente e Mudanças Climáticas - Microsoft Word - Estrategia CM- Revista 21 de Junho.doc (planoc.com.pt)

Plano Estratégico para o Desenvolvimento do Sector Agrário (PEDSA – 2011-2020), Microsoft Word - PEDSA 2011-20 FINAL CM EDITADO_31May2011CXD.doc (open.ac.uk)

A Alfabetização em Moçambique: desafios da educação para todos; Background paper for the Education for all global monitoring report 2006: literacy for life; 2005 (iese.ac.mz)

https://www.cgcmc.gov.mz/attachments/article/194/Estrategia%20Nacional%20de%20Adaptacao%20e%20Mitigacao%20das%20Mudancas%20%20Climaticas%20versao%20final.pdf

http://www.ts.gov.mz/images/PQG_2020.2024_Versao_AR_02042020-min.pdf

http://www.mct.gov.mz

https://www.mctes.gov.mz/wpcontent/uploads/2021/10/Compilac%CC%A7a%CC%83olegislativasobreCie%CC%82nciaeTecnologiadeMoc%CC%A7ambique.pdf

https://www.mctes.gov.mz/wpcontent/uploads/2021/10/Estrate%CC%81giadeCie%CC%82nciaTecnologiaeInovac%CC%A7a%CC%83odeMoc%CC%A7ambiqueECTIM.pdf

Consultation with the Designated Authority of the country:

Please indicate whether the technology concept has been developed in consultation with the Designated Authority of the country.

☒ The Designated Authority of the country has been engaged in the design of the technology concept and will be involved in the further process leading to the implementation of the micro-grants project.

Monitoring and evaluation:

By signing this form, I affirm that processes are in place in the country to monitor and evaluate the micro-grants project funded by the Adaptation Fund through UNEP-CTCN. I understand that these processes will be explicitly identified in the Project Concept Note (response plan of the micro-grants project) and that they will be used in the country to monitor the implementation of the micro-grants project.

I understand that, after the completion of the micro-grants project, I shall support UNEP-CTCN efforts to measure the success and effects of the support provided, including its short, medium and long-term impacts in the country.

Signature:

NDE name:	António Jorge Raul Uaissone
Date:	23/02/2022
Signature:	António Jorge Raul Uaissone

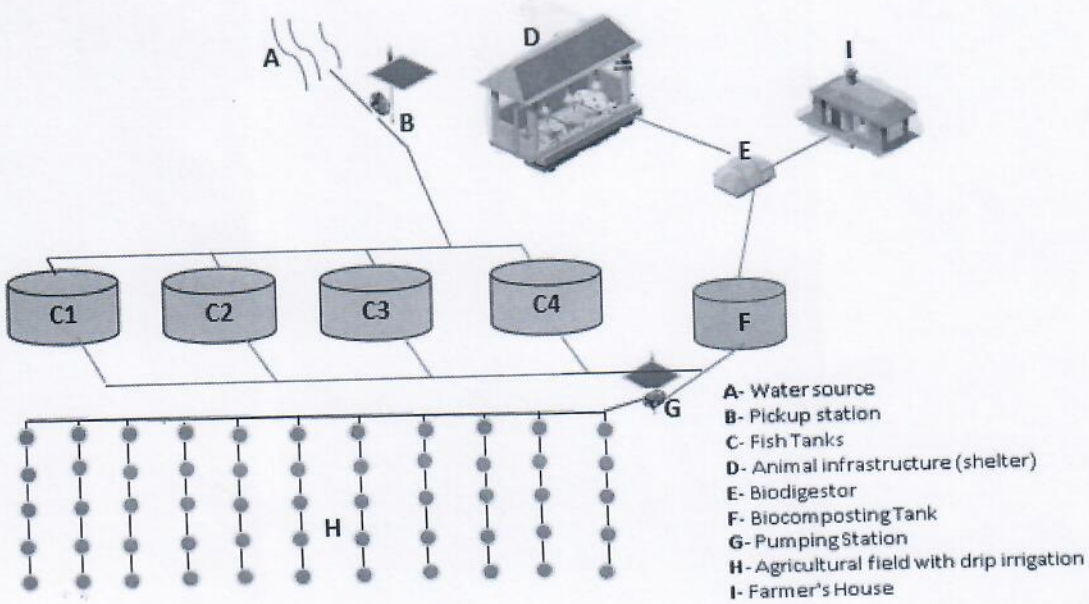
REPÚBLICA DE MOÇAMBIQUE MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR SECRETARIA CENTRAL

THE COMPLETED FORM SHALL BE SUBMITTED THROUGH A WEB-LINK AS BELOW:

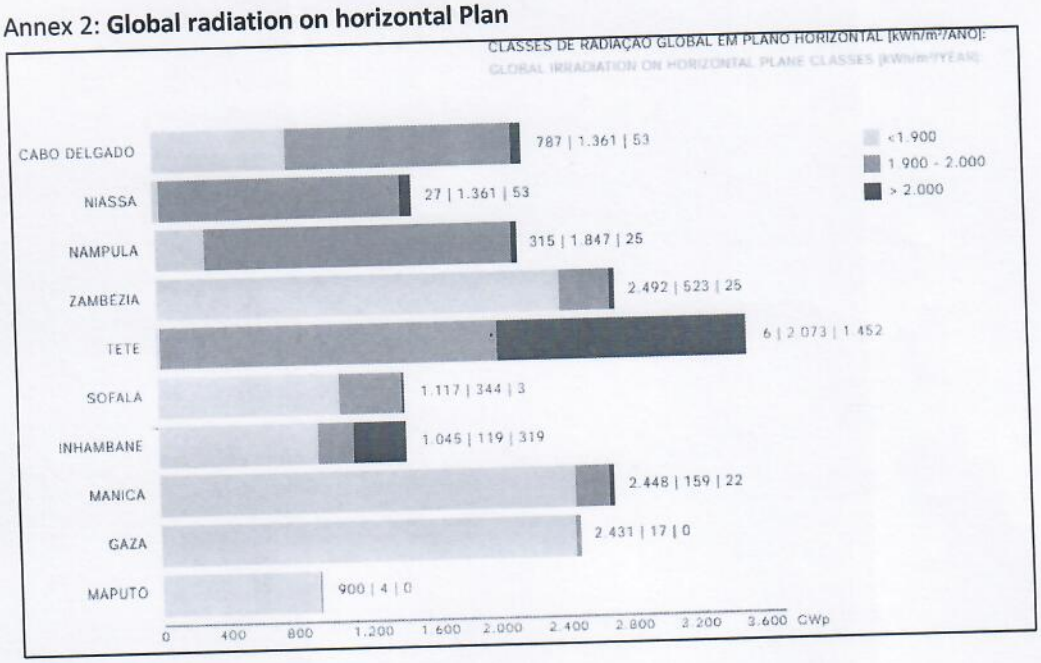
https://www.ctc-n.org/adaptation-fund-climate-innovation-accelerator-afcia-unep-ctcn

UNEP-CTCN is available to answer all questions and provide guidance on the application process.

Annex 1: **Scheme of the Agricultural System Unit**



Annex 2: **Global radiation on horizontal Plan**



Annex 3: **Socio-economic and Environmental Impact Indicators**

Item	Impacts	Quantity	Place
1	Establishment of Agrosystem Units for Adaptation and Mitigation to Climate Change	22	Tete (7), Manica(5), Zambézia (10)
2	Reduction of greenhouse gas emissions (including carbon dioxide) through the use of biogas and clean energy	6%	Zambezi Valley Region
4	Reduction in the use of inorganic fertilizers	8%	Zambezi Valley Region
5	Income generation through the establishment of integrated production systems per beneficiary	223,875.00MZN/ Campanha	Zambezi Valley Region
6	Impact on the management of water resources through the implementation of efficient irrigation systems	5%	Zambezi Valley Region
7	Increase in Food and Nutrition Security	1500 Famílias	Zambezi Valley Region