AFB/PPRC.23/19

Adaptation Fund Board
Project and Programme Review Committee
Twenty-third Meeting
Bonn, Germany, 9-10 October 2017

Agenda Item 6 m)

PROPOSAL FOR BHUTAN

Background

1. The Operational Policies and Guidelines (OPG) for Parties to Access Resources from the Adaptation Fund (the Fund), adopted by the Adaptation Fund Board (the Board), state in paragraph 45 that regular adaptation project and programme proposals, i.e. those that request funding exceeding US$ 1 million, would undergo either a one-step, or a two-step approval process. In case of the one-step process, the proponent would directly submit a fully-developed project proposal. In the two-step process, the proponent would first submit a brief project concept, which would be reviewed by the Project and Programme Review Committee (PPRC) and would have to receive the endorsement of the Board. In the second step, the fully-developed project/programme document would be reviewed by the PPRC, and would ultimately require the Board's approval.

2. The Templates approved by the Board (OPG, Annex 4) do not include a separate template for project and programme concepts but provide that these are to be submitted using the project and programme proposal template. The section on Adaptation Fund Project Review Criteria states:

> *For regular projects using the two-step approval process, only the first four criteria will be applied when reviewing the 1st step for regular project concept. In addition, the information provided in the 1st step approval process with respect to the review criteria for the regular project concept could be less detailed than the information in the request for approval template submitted at the 2nd step approval process. Furthermore, a final project document is required for regular projects for the 2nd step approval, in addition to the approval template.*

3. The first four criteria mentioned above are:
   1. Country Eligibility,
   2. Project Eligibility,
   3. Resource Availability, and
   4. Eligibility of NIE/MIE.

4. The fifth criterion, applied when reviewing a fully-developed project document, is:
   5. Implementation Arrangements.

5. It is worth noting that since the twenty-second Board meeting, the Environmental and Social (E&S) Policy of the Fund was approved and consequently compliance with the Policy has been included in the review criteria both for concept documents and fully-developed project documents. The proposals template was revised as well, to include sections requesting demonstration of compliance of the project/programme with the E&S Policy.

6. In its seventeenth meeting, the Board decided (Decision B.17/7) to approve "Instructions for preparing a request for project or programme funding from the Adaptation Fund", contained in the Annex to document AFB/PPRC.8/4, which further outlines applicable review criteria for both concepts and fully-developed proposals. The latest version of this document was launched in conjunction with the revision of the Operational Policies and Guidelines in November 2013.

7. Based on the Board Decision B.9/2, the first call for project and programme proposals was issued and an invitation letter to eligible Parties to submit project and programme proposals to the Fund was sent out on April 8, 2010.

8. According to the Board Decision B.12/10, a project or programme proposal needs to be received by the secretariat no less than nine weeks before a Board meeting, in order to be considered by the Board in that meeting.

9. The following regular-sized project concept document titled “Harnessing Alternative Renewable Energy Resources for Enhancing Community Resilience and Sustainable Food Security for Adaptation to Climate Change” was submitted by Bhutan Trust Fund for Environmental Conservation (BTFEC), which is a National Implementing Entity of the Adaptation Fund.

10. This is first submission of the proposal. It was received by the secretariat in time to be considered in the Thirty-second Board meeting. The secretariat carried out a technical review of the project proposal, assigned it the diary number BTN/NIE/Food/2018/1, and completed a review sheet.

11. In accordance with a request to the secretariat made by the Board in its 10th meeting, the secretariat shared this review sheet with BTFEC, and offered it the opportunity of providing responses before the review sheet was sent to the PPRC.

12. The secretariat is submitting to the PPRC the summary and, pursuant to decision B.17/15, the final technical review of the project, both prepared by the secretariat, along with the final submission of the proposal in the following section. In accordance with decision B.25.15, the proposal is submitted with changes between the initial submission and the revised version highlighted.

Project Summary

Bhutan – Harnessing Alternative Renewable Energy Resources for Enhancing Community Resilience and Sustainable Food Security for Adaptation to Climate Change

Implementing Entity: *Bhutan Trust Fund for Environmental Conservation (BTFEC)*
Project/Programme Execution Cost: USD N/A
Total Project/Programme Cost: USD N/A
Implementing Fee: USD N/A
Financing Requested: USD 10,000,000

Project Background and Context:

The primary purpose of the project, is to develop grid connected 3 MW solar and 2.4 MW wind power plants to enhance national energy security during the dry season and to enhance agriculture production and productivity at the selected community level using alternative renewable energy resources. The project has three main objectives:

- Diversification and exploration of Alternative Green Energy Resources using solar and wind energy to build up the national climate resilience.
- Enhance crop production and productivity for food security and import substitution through adoption of climate resilient smart farming technologies.
- Encourage and establish enterprise development opportunities for communities especially for the youth and vulnerable households in organic agriculture and renewable energy to create meaningful job opportunities.

Component 1: Diversification and exploration of Alternative Green Energy Resources

Under this component, a 3MW solar power plant will be installed and commissioned at Shingkhar; a 2MW wind power plant will be installed and commissioned at Rubesa, and a captive solar plant will be installed.

Component 2: Enhance crop production and productivity for food security and import substitution

This component will set up smart greenhouse technologies powered by the alternative renewable energy resources like solar, solar thermal, energy-storage systems.

Component 3: Encourage and establish enterprise development opportunities for communities

This component will establish a community center, hold a training workshop for youth and project beneficiaries on organic vegetable farming, have workshops with stakeholders, and gather documentation and dissemination of best practices & lessons learnt to other areas/communities.

ADAPTATION FUND

ADAPTATION FUND BOARD SECRETARIAT TECHNICAL REVIEW OF PROJECT/PROGRAMME PROPOSAL

PROJECT/PROGRAMME CATEGORY: Regular-sized Project Concept

Country/Region: **Bhutan**
Project Title: **Harnessing Alternative Renewable Energy Resources for Enhancing Community Resilience and Sustainable Food Security for Adaptation to Climate Change**
AF Project ID: **BTN/NIE/Food/2018/1**
IE Project ID: Requested Financing from Adaptation Fund (US Dollars): **$10,000,000**
Reviewer and contact person: **Saliha Dobardzic** Co-reviewer(s): **Ming Yang**
IE Contact Person: **Pema Choephyel, Bhutan Trust Fund for Environmental Conservation (BTFEC)**

Review Criteria	Questions	Comments on 20/8/2018	Comments on 9/9/2018
Country Eligibility	1. Is the country party to the Kyoto Protocol?	Yes, Bhutan signed Kyoto Protocol on 26 August 2002.	
	2. Is the country a developing country particularly vulnerable to the adverse effects of climate change?	Yes. Bhutan is still a LDC country. Being a landlocked and mountainous developing country, Bhutan is particularly vulnerable to the adverse effects of climate change.	
Project Eligibility	1. Has the designated government authority for the Adaptation Fund endorsed the project/programme?	Yes.	

	2. Does the project / programme support concrete adaptation actions to assist the country in addressing adaptive capacity to the adverse effects of climate change and build in climate resilience?	Yes, however more detail is requested. The project will likely lead to installation of 5MW new renewable power (solar and wind) to Shingkhar and Rubesa areas where there is great potential for scaling up the new renewable power investment to increase food production and processing. With this increased renewable power generation capacity, communities in Shingkhar and Rubesa areas will be greatly empowered with climate change resilience. However, the concept and project premise should be supported by evidence and data on how and to what extent climate change has impacted the water resources upon which both hydropower and agriculture depend. This evidence should be the basis upon which the project has been designed to qualify as an adaptation project. **CR1**: Please add data on the documented and projected climate change impacts in the target project regions on water resources to justify the adaptation activities proposed in both the energy and agriculture sectors across all three components. **CR2**: Please clarify how the target project sites were selected.	CR1: Addressed, additional information and evidence has been provided on the current and projected climate change impacts expected to affect Bhutan. CR2: Yes, however reports and study references were not provides.

	3. Does the project / programme provide economic, social and environmental benefits, particularly to vulnerable communities, including gender considerations, while avoiding or mitigating negative impacts, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Yes, however more detail is requested. The country is in need of new renewable energy for sustainable economic and social development. This project will facilitate the supply and diversity of sources new renewable power. **CR3**: Please provide more detail about the number of beneficiaries of the project (across benefit types). **CR4**: Please expand on how the project will it will engage, involve and benefit women and other marginalized groups; and how the selected vulnerable farmers were identified for the project. **CR5**: Since the project will require construction of new energy plants, please clarify how the project will ensure compliance with the Environmental and Social Policy and Gender Policy of the Fund. For example, please clarify which entity will own and operate the new installed energy plants and cost model for selling energy to farmers.	CR3: Addressed sufficiently for the concept stage. CR4: Somewhat addressed. While it is understood that a large part of what this project aims to accomplish is at the national level, there are still measures the project should take to ensure that the project involves and benefits women -in terms of the design of the project and access to benefits, energy, or resources. CR5: Addressed adequately for the concept stage.

	4. Is the project / programme cost effective?	Not justified. In order to demonstrate cost-effectiveness, the proposed activities should be compared to viable alternative. **CR6**: Please provide more information on the capital investment to justify that the installation of 5MW solar and wind power in the country is cost-effective. Please elaborate if the investment cost of US$3/W will cover grids or batteries. Per the project concept, the capital cost of installing one Watt (W) of solar/wind power is US$3.The document does not show details on the investment. Note: per the International Renewable Energy Agency, the global weighted average total capital cost for utility-scale solar PV fell from US$4394/kW ($0.439/W) in 2010 to US$1388/kW ($1.388/W) in 2017. **CR7**: Please also use other similar solar or wind project data in neighbouring countries to justify the costs, if there is any data available. **CR8**: Please compare the proposed project approach to addressing the key adaptation challenge (project objective) to other viable alternatives to justify cost-effectiveness.	CR6: Somewhat addressed. The proponent should fully outline how the cost was concluded and how, during the project development, the design will be fully costed out. CR7: Not addressed CR8: Not addressed. The proponent had not identified viable alternatives or justified the project on a cost-effectiveness basis.
	5. Is the project / programme consistent with national or sub-national sustainable development strategies, national or sub-national development plans, poverty reduction strategies, national communications and adaptation programs of action and other relevant instruments?	Yes. The project aims at achieving 4 SDGs and linkages with other SDGs prioritized by Bhutan out of the 17 SDGs. However, clarification is requested. **CR9**: Please clarify if the proposed project is in alignment with the Country's NDC to the Paris Agreement, National Adaptation Plan, or other relevant climate change strategy or plan.	CR9: Addressed

	6. Does the project / programme meet the relevant national technical standards, where applicable, in compliance with the Environmental and Social Policy of the Fund??	Possibly and much more detail will be required, particularly at the fully-developed proposal stage. It is our understanding that Bhutan does not have its own technical standards for new renewable energy technologies (ADB 2012). If this remains the case, it is suggested that the project team use the national standards of India or another South Asian country for solar and wind power in this project. **CR10**: Please provide a more complete assessment of relevant technical standards, as this project will require construction and energy distribution.	CR10: Addressed sufficiently for the concept stage but much more detail will be required during project development.
	7. Is there duplication of project / programme with other funding sources?	Possibly, the proponent has not justified that the project does not duplicate other efforts in the region. **CR11**: Please develop a matrix to show the objectives and targeted outputs of existing similar projects and programs in the country versus this proposed project. This should lead to a brief comparative analysis and conclusion on how complementarity between this project and others will be achieved.	CR11: Not addressed. The table provided is vague and does not specify the scale of the project, region, objective, or implementation entity.
	8. Does the project / programme have a learning and knowledge management component to capture and feedback lessons?	No. **CR12**: Please focus on "how" the project will capture and disseminate knowledge, experience, and lessons to relevant local and nationwide stakeholders. For example, "capturing knowledge, experience, and lessons" can be done through annual progress report, mid-term, project terminal and post evaluations. "Disseminating knowledge, experience, and lessons" can be done through national workshops, newspapers, TV programs, etc.	CR12: Somewhat addressed. The description is vague and does not outline the types of knowledge dissemination relative to the type of information the project aims to build awareness on.

	9. Has a consultative process taken place, and has it involved all key stakeholders, and vulnerable groups, including gender considerations in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Not completed at this time. Installing solar PV and wind power will involve land use and management and will require the buy-in of local officials and communities. **CR13**: The project states that "people at the project sites" were consulted but no report was provided. Please consult the local communities to make sure there is no conflict between land use for agriculture and land use for new renewable power generation. If local communities have not been consulted, please justify why not. **CR14**: Please also make sure the vulnerable and female populations will be consulted in terms of interests and benefits, and include a plan for how gender considerations will be taken into account in the project. In particular, please also include information on the rationale for component 3 in this context.	CR13: Somewhat addressed. The proponent references consultations but has not provided any report of outcome analysis. CR14: Somewhat addressed as this is a priority for the full project development.
	10. Is the requested financing justified on the basis of full cost of adaptation reasoning?	Not clear. Please refer to the section on Resource Availability below. Furthermore, some clarification is requested. The project funding will be provided to address the adverse effects of climate change. The capital investment costs in this project will be used to install new renewable power generation capacity that will enhance agricultural production capability and food processing power in Shingkhar and Rubesa areas, which will contribute to adaptation and climate resilience of the country. However, the project must first be justified on a strong climate change basis for all three components, and the project document should compare a baseline (no AF project) to the project contribution (with AF project) for each component. **CR15**: Please restructure this section to compare a baseline (no AF project) to the project contribution (with AF project) for each component.	CR15: Not addressed. This section should compare – component by component – the baseline to the project contribution.

	11. Is the project / program aligned with AF's results framework?	No. It seems that there are errors on page 20, in connection with the targeted output 1.2 and output 1.3. **CR16**: Please double check it and revise the framework if necessary. Please also put targeted numbers for outcome 3 and output 3 on page 20.	CR16: Addressed.
	12. Has the sustainability of the project/programme outcomes been taken into account when designing the project?	Not clear. **CR17**: Please justify how to ensure the solar PV and wind power generation facilities will be well maintained for sustainable operations after the project implementation period is over. Technical staff, spare parts, and labour costs should be budgeted for the sustainable operation of the power generation facilities in their lifetime. **CR18**: Please clarify if any part of the project will be financed or sustained by the national government, the private sector, any power generation company, and the local communities.	CR17: Addressed sufficiently for the concept stage. CR18: Addressed sufficiently for the concept stage -more detail needed for the full project development.
	13. Does the project / programme provide an overview of environmental and social impacts / risks identified, in compliance with the Environmental and Social Policy and Gender Policy of the Fund?	Not completely. **CR19**: Please complete the table on page 16 more thoroughly. With a project of this size involving energy generation and construction, it is unlikely that the proponent will not have any issues to address on benefit sharing, engagement of vulnerable populations, land rights, determining price of energy, to name a few.	CR19: Not addressed.
Resource Availability	1. Is the requested project / programme funding within the cap of the country?	No. The country cap for single-country projects is currently set at $10 million. **CAR 1:** Please revise the funding request such that it does not exceed the funding	CAR1: Not addressed, the main project component table still has a

		that is currently available under the country cap.	funding request of $15 million.
	2. Is the Implementing Entity Management Fee at or below 8.5 per cent of the total project/programme budget before the fee?	Yes, 6%	
	3. Are the Project/Programme Execution Costs at or below 9.5 per cent of the total project/programme budget (including the fee)?	Yes, 2%	
Eligibility of IE	4. Is the project/programme submitted through an eligible Implementing Entity that has been accredited by the Board?	Yes, the proposal has been submitted by an accredited NIE.	
Implementation Arrangements	1. Is there adequate arrangement for project / programme management, in compliance with the Gender Policy of the Fund?	N/A at concept stage	
	2. Are there measures for financial and project/programme risk management?	N/A at concept stage	
	3. Are there measures in place for the management of for environmental and social risks, in line with the Environmental and Social Policy and Gender Policy of the Fund?	N/A at concept stage	
	4. Is a budget on the Implementing Entity Management Fee use included?	N/A at concept stage	

	5. Is an explanation and a breakdown of the execution costs included?	N/A at concept stage	
	6. Is a detailed budget including budget notes included?	N/A at concept stage	
	7. Are arrangements for monitoring and evaluation clearly defined, including budgeted M&E plans and sex-disaggregated data, targets and indicators, in compliance with the Gender Policy of the Fund?	N/A at concept stage	
	8. Does the M&E Framework include a break-down of how implementing entity IE fees will be utilized in the supervision of the M&E function?	N/A at concept stage	
	9. Does the project/programme's results framework align with the AF's results framework? Does it include at least one core outcome indicator from the Fund's results framework?	N/A at concept stage	
	10. Is a disbursement schedule with time-bound milestones included?	N/A at concept stage	

Technical Summary	The final technical review of the project concept document finds that the proponent has not adequately resolved the clarification requests and has not provided sufficient information for this stage. Namely, the project has not provided adequate information on the cost-effectiveness of the proposed project approach, review of the environmental and social risks of the project, and has not justified the project on a full cost of adaptation basis. This project is linked to installing new power generation capacity, which will likely contribute to sustainable power

	export of the country, and building a most resilience agricultural sector. The project has the potential to become an example of integrating climate change mitigation, climate change adaptation, land management, and food security. However, the proposal needs to be revised as follows: **CAR 1:** Please revise the funding request such that it does not exceed the funding that is currently available under the country cap. The following clarification requests are made to clarify key details of the project: **CR1**: Please add data on the documented and projected climate change impacts in the target project regions on water resources to justify the adaptation activities proposed in both the energy and agriculture sectors across all three components. **CR2**: Please clarify how the target project sites were selected. **CR3**: Please provide more detail about the number of beneficiaries of the project (across benefit types). **CR4**: Please expand on how the project will it will engage, involve and benefit women and other marginalized groups; and how the selected vulnerable farmers were identified for the project. **CR5**: Since the project will require construction of new energy plants, please clarify how the project will ensure compliance with the Environmental and Social Policy and Gender Policy of the Fund. For example, please clarify which entity will own and operate the new installed energy plants and cost model for selling energy to farmers. **CR6**: Please provide more information on the capital investment to justify that the installation of 5MW solar and wind power in the country is cost-effective. Please elaborate if the investment cost of US$3/W will cover grids or batteries. Per the project concept, the capital cost of installing one Watt (W) of solar/wind power is US$3.The document does not show details on the investment. Note: per the International Renewable Energy Agency, the global weighted average total capital cost for utility-scale solar PV fell from US$4394/kW ($0.439/W) in 2010 to US$1388/kW ($1.388/W) in 2017. **CR7**: Please also use other similar solar or wind project data in neighbouring countries to justify the costs, if there is any data available. **CR8**: Please compare the proposed project approach to addressing the key adaptation challenge (project objective) to other viable alternatives to justify cost-effectiveness. **CR9**: Please clarify if the proposed project is in alignment with the Country's NDC to the Paris Agreement, National Adaptation Plan, or other relevant climate change strategy or plan. **CR10**: Please provide a more complete assessment of relevant technical standards, as this project will require construction and energy distribution. **CR11**: Please develop a matrix to show the objectives and targeted outputs of existing similar projects and programs in the country versus this proposed project. This should lead to a brief comparative analysis and conclusion on how complementarity between this project and others will be achieved. **CR12**: Please focus on "how" the project will capture and disseminate knowledge, experience, and lessons to

	relevant local and nationwide stakeholders. For example, “capturing knowledge, experience, and lessons” can be done through annual progress report, mid-term, project terminal and post evaluations. “Disseminating knowledge, experience, and lessons” can be done through national workshops, newspapers, TV programs, etc. **CR13**: The project states that “people at the project sites” were consulted but no report was provided. Please consult the local communities to make sure there is no conflict between land use for agriculture and land use for new renewable power generation. If local communities have not been consulted, please justify why not. **CR14**: Please also make sure the vulnerable and female populations will be consulted in terms of interests and benefits, and include a plan for how gender considerations will be taken into account in the project. In particular, please also include information on the rationale for component 3 in this context. **CR15**: Please restructure this section to compare a baseline (no AF project) to the project contribution (with AF project) for each component. **CR16**: Please double check it and revise the framework if necessary. Please also put targeted numbers for outcome 3 and output 3 on page 20. **CR17**: Please justify how to ensure the solar PV and wind power generation facilities will be well maintained for sustainable operations after the project implementation period is over. Technical staff, spare parts, and labour costs should be budgeted for the sustainable operation of the power generation facilities in their life time. **CR18**: Please clarify if any part of the project will be financed or sustained by the national government, the private sector, any power generation company, and the local communities. **CR19**: Please complete the table on page 16 more thoroughly. With a project of this size involving energy generation and construction, it is unlikely that the proponent will not have any issues to address on benefit sharing, engagement of vulnerable populations, land rights, determining price of energy, to name a few.
Date:	9/9/2018

REQUEST FOR PROJECT/PROGRAMME FUNDING FROM THE ADAPTATION FUND

The annexed form should be completed and transmitted to the Adaptation Fund Board Secretariat by email or fax.

Please type in the responses using the template provided. The instructions attached to the form provide guidance to filling out the template.

Please note that a project/programme must be fully prepared (i.e., fully appraised for feasibility) when the request is submitted. The final project/programme document resulting from the appraisal process should be attached to this request for funding.

Complete documentation should be sent to:

The Adaptation Fund Board Secretariat
1818 H Street NW
MSN P4-400
Washington, D.C., 20433
U.S.A
Fax: +1 (202) 522-3240/5
Email: afbsec@adaptation-fund.org

ADAPTATION FUND

PROJECT/PROGRAMME PROPOSAL TO THE ADAPTATION FUND

PART I: PROJECT/PROGRAMME INFORMATION

Project/Programme Category:	Regular
Country/ies:	Bhutan
Title of Project/Programme:	Harnessing Alternative Renewable Energy Resources for Enhancing Community Resilience and Sustainable Food Security for Adaptation to Climate Change
Type of Implementing Entity:	National Implementing Entity
Implementing Entity:	Bhutan Trust Fund for Environmental Conservation (BTFEC)
Executing Entity/ies:	Ministry of Economic Affairs and Ministry of Agriculture & Forests
Amount of Financing Requested:	USD 10,000,000 Million (in U.S Dollars Equivalent)

Project / Programme Background and Context:

Provide brief information on the problem the proposed project/programme is aiming to solve. Outline the economic social, development and environmental context in which the project would operate.

The Kingdom of Bhutan is a landlocked mountainous country in South Asia located in the Eastern Himalayas and bordered by Tibet Autonomous Region of China in the north & west and India in the south & east. Its pursues the Gross National Happiness (GNH) as its development philosophy, a new development paradigm shift from use of classical Gross National Product (GDP) as indicator to GNH as more holistic development progress indicator. It reflects its deep values and strong commitment for preservation of rich cultural heritage, pristine environment, and promotion of balanced sustainable development and good governance. All development policies and programmes are pursued if they demonstrate strong linkages to the principles and embodiment of GNH as its end goals. Guided by this GNH Philosophy and motivated by its success in maintaining the integrity of its pristine environment, the Royal Government of Bhutan (RGoB) has committed to remain carbon neutral to the international community and in fact, Bhutan is the only carbon negative Country in the world, which absorbs more emission than it emits. Resounding its resolute to remain carbon neutrality, the RGoB continues to make conscious effort to develop its hydropower resources with the motivation to meet not only its growing energy demand within the Country but also to export surplus power to neighboring country India to help reduce emission reduction in the region, which is dependent mostly on thermal power plants to serve its base load.

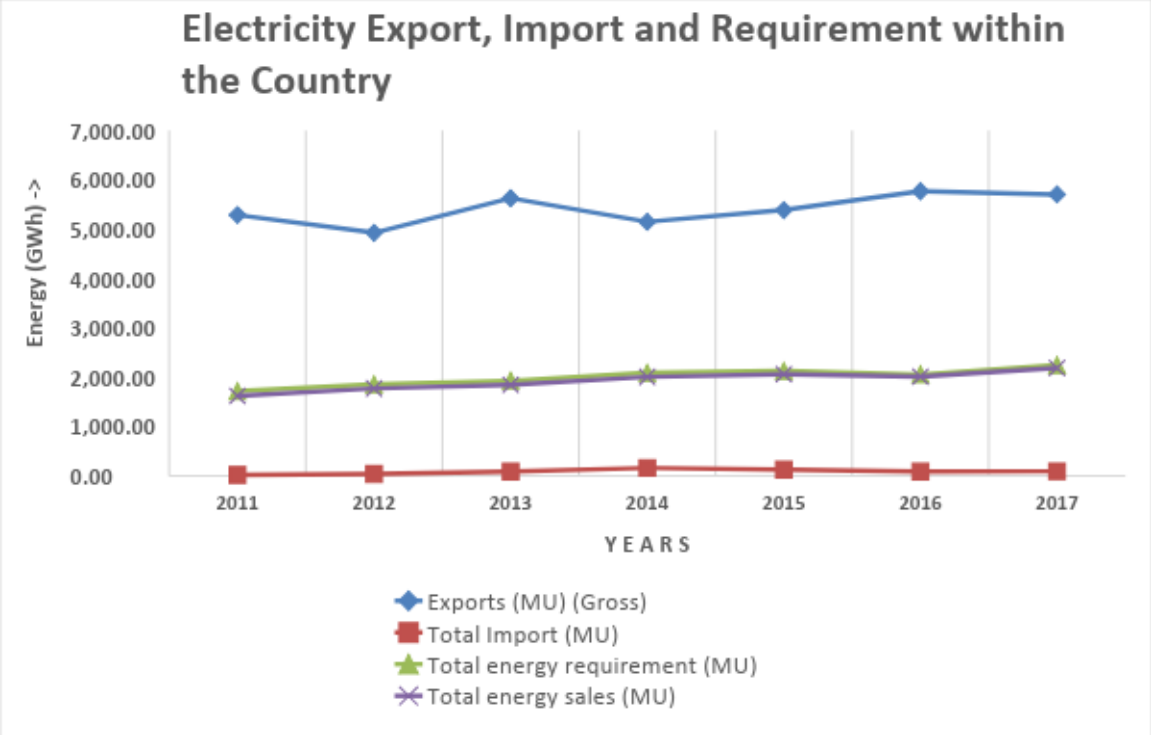

Fig 1: Total energy generated and export/import of electricity

Currently, 99% of electricity generation in the Country comes from hydropower resources, with current installed capacity of 1,606 Megawatt (MW) and three mega projects totaling 3700 MW are under construction. All these hydropower plants are run-of-the-river schemes that are built mostly along the north south flowing rivers, largely fed by the small East-West or West-East flowing small rivers and streams. Since the hydropower plants are run-of-the-river schemes without reservoirs, the hydropower generation capacity runs extremely low during the lean season as shown in the figure-1 often requiring to import the deficit power from India.

One of the prime reasons for the industrial developments taking place in the Country is attributable to the availability of its competitive electricity tariff in the region USD 34,308/Million Unit. However, due to low hydropower power generation capacity during the lean season and when supply cannot meet the demand, the deficit power is imported from India at the average cost of USD 40,000/Million Unit. For the same reason, the industrial development has been restricted by its limited firm power. Therefore, if industrial growth is to be allowed, the farm power capacity has to be ramped up as fast as the industrial development rate. However, if the ramping up power supply is dependent solely on hydropower resources alone and not diversity the source, the risks will sustain as its generation will depend on precipitation.

However, in the recent times, drying up of spring water sources used for drinking and irrigation purposes has been reported from different parts of the Country. Since these small river streams feed large river systems where hydropower plants have been built, any hydrological regime change triggered either by climate change and/or long stretch of drought could have significant impact on two very important aspects

that the Country critically depend on for its socio-economic progress namely (i) the hydropower generation capacity and hence the nation's revenue earning potential to support its socio-economic development and (ii) Agriculture production and productivity where 60% of the population depend for their livelihood sustenance.

Bhutan is predominantly an agriculture-based society and therefore agriculture has been identified as one of the Five Jewels that has significant growth potential in the Economic Development Policy 2016. However, due to increasing food demand, rapid urbanization, economic transformation, rising rural-urban migration and climate change, the agriculture sector productivity potential is highly constrained by the adverse effects of climate to meet the growing demand. The agriculture products and productivity are highly sensitive to climate condition and calls for availability of adequate perennial streams and seasonal rainfall and appropriate temperature levels. Therefore, drying up of spring water sources being reported from multiple pockets of the Country is recognized as a serious indicator calling for proactive and appropriate interventions to contain them before it is too late.

Further, development of renewable energy resources like solar and wind technologies is recognized as environmentally benign interventions that do not pollute and rather serve as natural choice for pursuing green economy development pathways. The RGoB has already achieved 100% electrification rate by 2017 and development of grid-connected solar and wind energy technologies has the potential to assure reliability power supplies and avoid the rural people use fuel-wood for meeting their cooking and heating requirements. The impact of less dependence on fuel-wood, in turn, will reduce the pressure on the forest cover and hence contribute in maintaining the carbon sequestration capacity as committed by the Nation to the International Community. The motivation for promoting alternative renewable energy resources like solar and wind energy at the national level is to use the results and lessons learned obtained from the pilot project to scale up to meet all its domestic energy demand in the long run not impacted by the change of precipitation regime.

The 3 MW Solar Power Plant is proposed to develop at Shingkhar under Bumthang district as shown in figure 2. The population of Bumthang district is 17,820 as of 2017 (Population and Housing Census of Bhutan, 2017). Out of 17,820 persons, 9,396 are male (52.7%) and 8,424 are female (47.3%). The total area is 2,667 Sq. Km and the population density is about 7 persons per Sq. Km. The unemployment rate for the district is 1.6% as of 2017. The site has potential to accommodate 35 MW of solar plant and current proposed capacity is aimed to help in scale-up to develop the full potential based on the lessons learned.

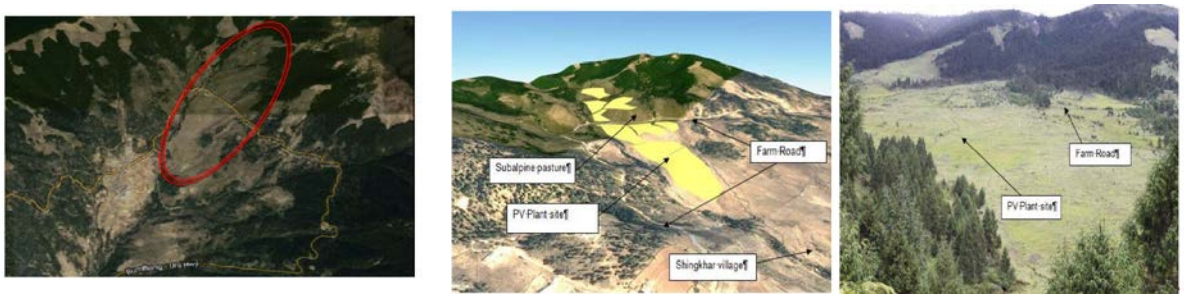

Figure 2: Solar Project site at Shingkhar, Bumthang

The 2.4 MW wind power plant is proposed to develop at Rubesa under Wangdue Phodrang district as shown in figure 3. The population of Wangdue Phodrang district is 42,186 as of 2017 (Population and Housing

Census of Bhutan, 2017). Out of 42,186 persons, 24,302 are male (57.6%) and 17,884 are female (42.4%). The total area is 4,029 Sq.Km and the population density is about 10 persons per Sq. Km. The unemployment rate for the district is 1.5% as of 2017. The site has the potential to accommodate 8 to 12 MW of capacity and proposed capacity is only to help scale-up the development to harness the full potential in future.

Figure 3: Wind Power Site at Rubesa

Energy is needed at every stage of food chains. The relationship between energy and food production have evolved and grown stronger over the time as agriculture has become increasingly reliant on irrigation and mechanization. Post production activities such as food storage, cooling, processing and distribution are also energy intensive. Consequently the cost of energy have direct impact on the production costs of the agriculture sector and food process, in particular in the case of medium to large farms, therefore, the integration of renewable energy into food production chain will give better opportunity for the farms as well as towards adaptation to climate change effects. A safe integration of food and energy production may be one of the best ways to improve national food and energy security and simultaneously reduce poverty in a climate smart way.

The enhancement of agriculture production and productivity at the community will entail deployment of advanced Smart Greenhouse Technologies powered by the alternative renewable energy resources like solar PV, Solar Thermal, Energy-storage systems. Light Emitting Diodes (LEDs) and smart control system, that are not impacted by the climate change in its operation and production. The location of these Smart Greenhouse technologies will be piloted under Bumthang and Wangdue Phodrang districts. The energy requirement for these Smart Greenhouse technologies will be supplied from captive and stand-alone alternative renewable energy systems developed for the same.

Therefore, the primary purpose of the captioned Project under Adaptation Fund, is to develop (i) grid connected 3 MW solar and 2.4 MW wind power plants to enhance national energy security during the lean season and to (ii) enhance agriculture production and productivity at the selected community level using alternative renewable energy resources.

In preparation for the Country to tackle the climate change impact, it has been strategically proposed to pursue climate change impact adaptation at two levels, national and community level. At the national level, it is aimed at securing the energy security by diversifying its supply-mix using alternative renewable energy resources and other at the community level, where climate resilient agriculture production and productivity, can be piloted by using Green Smart Technologies powered by alternative renewable energy resources.

Project / Programme Objectives:

List the main objectives of the project/programme.
The objectives of the project are;

(i) Diversification and exploration of Alternative Green Energy Resources using solar and wind energy to build up the national climate resilience.
(ii) Enhance crop production and productivity for food security and import substitution through adoption of climate resilient smart farming technologies.
(iii) Encourage and establish enterprise development opportunities for communities especially for the youth and vulnerable households in organic agriculture and renewable energy to create meaningful job opportunities.

Project / Programme Components and Financing:

Fill in the table presenting the relationships among project components, activities, expected concrete outputs, and the corresponding budgets. If necessary, please refer to the attached instructions for a detailed description of each term.

For the case of a programme, individual components are likely to refer to specific sub-sets of stakeholders, regions and/or sectors that can be addressed through a set of well defined interventions / projects.

Project/Programme Components	Expected Concrete Outputs	Expected Outcomes	Amount (US$)
Component 1: Diversification and Exploration of Alternative Green Energy Resources	Efficient and alternative green energy power plant installed and commissioned	Guaranteed energy supply for households and contribute to energy security	10,000,000
Component 2: Enhance crop production and productivity for food security and import substitution	Protected cultivation structures, storage and processing structures established	● Demonstrated effective use of RE for intensive farming (for climate control, irrigation, processing, heat supply, etc.)	3,500,000

		• Enhanced year round production of high value crops for domestic and export market.	
Component 3: Encourage and establish enterprise development opportunities for communities	• Enhanced knowledge and skills of the stakeholders • Establish business community centre	Business opportunity created for private enterprises or youth in agriculture.	400,000
6. Project/Programme Execution cost			250,000
7. Total Project/Programme Cost			14,150,000
8. Project/Programme Cycle Management Fee charged by the Implementing Entity (if applicable)			850,000
Amount of Financing Requested			15,000,000

N.B.: The above costs are indicative figures and detailed cost estimates including the implementation framework will be worked out under the project formulation assistance sought under Adaptation Fund. The scope of the preparatory works and the resources required are projected in the project formulation assistance application form submitted along with this concept paper.

Projected Calendar:

Indicate the dates of the following milestones for the proposed project/programme

Milestones	Expected Dates
Start of Project/Programme Implementation	January 2019
Mid-term Review (if planned)	July 2021
Project/Programme Closing	December 2023
Terminal Evaluation	March 2024

PART II: PROJECT / PROGRAMME JUSTIFICATION

A. *Describe the project / programme components, particularly focusing on the concrete adaptation activities of the project, and how these activities contribute to climate resilience. For the case of a programme, show how the combination of individual projects will contribute to the overall increase in resilience.*

The published data on impacts of climate change is limited. However, several cases across the Country have reported the drying up of spring waters, which serve as critical water source for drinking and irrigation purposes for the communities and hydropower generation at the national level. Further, with rising population, increasing demand for food, rapid industrialization and economic transformation, increasing rural-urban migration and the changing global climate, the country is confronted with number of challenges, which are exacerbated by the adverse impacts of climate. For example, the farm productions are highly dependent on perennial streams and timing of the monsoons and hydropower production critically depends on the availability of adequate water in our river system. Any adverse change in hydrological precipitation regime has significantly makes the County highly vulnerable. To address these issues, ensuring secured, reliable and affordable energy system is seen as the robust national strategy to build up the climate resilience both at the level of community through the introduction of climate smart farming system by harness alternative energy sources and at the national level by diversifying the energy supply mix using alternate source of energy. Climate proofing becomes feasible only when there is access to energy that is affordable, reliable and secured and allows to adoption of appropriate technologies.

Bhutan is endowed with enormous water resources draining 2238 m^3/sec annually but precipitation and surface runoff are the main sources of water (DoA, National Irrigation Master plan 2016) which are highly susceptible to changes in seasonal water availability, floods, and landslides which in turns are influenced by anticipated changes in climatic parameters like rainfall and temperature. As a result, it is expected that climate change may not only negatively impact rain-fed agriculture, but also irrigated agriculture production and Bhutan's energy source (Hydro power). Further, about three forth of the agriculture land in Bhutan is rain-fed and depend almost entirely on monsoon rains for crop production. Hence the impact of climate change on Bhutan's overall agriculture production will be severe. It is predicted that agriculture production may decline by 4 to 10% in the future if appropriate measures are not taken to mitigate or adapt to climate change. Changes in weather and climate are already having an impact on regional ecosystems, evident by significant losses in the size and distribution of Himalayan glaciers, as well as the decreased water availability for irrigation, agriculture, hydropower and household uses (Shrestha et al. 2012).

Temperature and precipitation are two key climatic variables most influenced by climate change, which is predicted to affect seasonal water availability having greater impact on country's overall economy. Hydro-meteorological data projections point out a change in climatic variables with overall increase in temperature and large spatial and temporal variations in rainfall (TA 8623 R5, 2016). Bhutan's annual average temperature is likely to increase by 1^{o}C from 2010 to 2039, and by 2^{o}C from 2040 to 2069 and project changes in the amount and seasonality of precipitation, with wetter conditions in the warm monsoon months, and slightly drier conditions in dry winter months (BMCI, 2016). The change in the amount and seasonality of precipitation will likely affect not only the hydropower and domestic water sector of Bhutan, but also the water used for irrigation.

Although Bhutan has not experienced severe water shortages in the past, reports of dwindling water sources are increasing, and climate change may render the country much more vulnerable. All districts have noted the issue of acute water shortages for drinking and attributed such recent issues, as increasing fallowing of agricultural land in the rural communities, to the drying of water sources. The increasing demand for water

flowing in from all the country means that adaptation measures are necessary for the efficient use of water, and also deal with impacts of climate change on water resources.
Therefore, it is envisaged that the project will not only look at adaptation measures at the local project site but would have far reaching implication at the national level because of its dependence on water resources for hydro power generation that is the backbone of national economy.

This project proposes three specific components that focuses on (i) diversification and explode productivity to ensuring food security and (ration of alternate energy resources, (ii) Enhance crop production and (iii) establishment of production infrastructures powered by alternative energy system.

Proposes Activities

Component 1: Diversification and exploration of Alternative Green Energy Resources

1.1 Rationales for specific project site selection

Renewable Energy (RE) cannot be installed anywhere unless the specific site is assessed to be technically feasible, candidate project is socio-economically justifiable and environmentally favorable. Under ADB TA, the detailed technical study has been carried out Shingkhar. The study report has revealed that the site has the potential to develop 30MW of solar and has recommended this potential be harnessed in three phases so that the lesson learned from first phase could be used to scale up the project development. Therefore, the proposed project size of 3 MW is being proposed under AF fund as fraction of larger capacity proposed to be piloted and use the lessons learned to scale up the development to harness the full potential. In other words, the proposed solar site is being identified based on the detailed study report.

Wind power project at Rubesa under Wangdi district has been proposed based on experience of developing 2x300 KW wind power plant at the vicinity of the proposed site where the performance of the wind turbines were found to be very encouraging. The proposed site, through the observation, is found to be ideal place for developing wind farms. While the proposed capacity is about 2 MW, the site has the potential for 8 to 12 MW depending on the size of the turbine being used. The larger the turbine size, the greater will be the generation capacity.

The agriculture site has been chosen based on the vulnerability of the population at the project site of the renewable energy project sites - Shingkhar and Rubesa. The data shows that Shingkhar, Ura has a total population of 1,724 with 229 households who are dependent on rain fed agriculture with poor resilience to any climate change. Similarly, Rubesa has a total population of 2,179 with 209 households who are dependent on again the rain fed agriculture mainly paddy cultivation. The project site is windy and dry leading to high evapotranspiration of water in the selected site leading to high requirement of water for agriculture purposes. In both the sites, the households being dependent on agriculture are highly vulnerable to the climate change. The project targets at least 50 percent of the households for climate resilient activities in terms of agriculture productivity.

The following activities will be carried out under Component 1:

1.1 Installation and commissioning of 3 MW solar power plant at Shingkhar

- 1.1.1 Finalization of 3 MW solar power design
- 1.1.2 Procurement of equipment
- 1.1.3 Installation and commissioning of 3 MW solar power plant

1.2 Installation and commissioning of 2 MW wind power plant at Rubesa

1.2.1 Finalization of project design
1.2.2 Procurement of equipment
1.2.3 Installation and commissioning of 2 MW wind power plant

1.3 Installation of captive solar power plant

1.3.1 Identification of sites
1.3.2 Design of the infrastructural and energy requirements
1.3.3 Procurement of equipment
1.3.4 Installation and commissioning of captive solar power plant at the identified sites

Component 2: Enhance crop production and productivity for food security and import substitution

The following activities will be carried out under Component 2:

2.1. Integration of renewable energy in agriculture production system

2.1.1. Making availability of irrigation water for the community of Rubesa - Pumping water from nearby perennial river or water source with use of energy generated from wind power plant proposed in Rubesa, Wangdue Phodrang for the community as the community faces acute water shortage for agriculture production.

2.1.2. Promotion of climate resilient crop varieties (stress tolerant crop varieties), water harvesting structures, water use efficient irrigation systems and organic agriculture production systems in both the project pilot sites.

2.1.3. Establishment of cold storage facility with energy supplement from wind power plant – Wangduephodrang, Punakha, Tsirang and Dagana districts are major vegetable producing districts in the country during normal season with total production of 20,921.7 MT (Metric tonnes) of vegetables in 2017. Besides vegetables, Wangdue Phodrang district is the major potato producing districts in the country with total production of 17,001 MT in 2017. Therefore, establishment of cold storage facility (about 20-50 MT capacity) in that area powered by energy obtained from wind power plant managed by the community/cooperatives will have huge benefits for the farming households as a whole for the districts in West Central part of the country for storage, preservation and marketing during the off season.

2.1.4. Solar energy for heating, drying and processing in Shingkhar, Bumthang – Promotion of household level polyhouse dryer and processing with energy supplement from the solar plant. The community are mostly involved in mushroom and medicinal plants which requires proper drying and processing to maintain the quality of the final product.

2.2. Establishment of production infrastructure (Greenhouses) powered by renewable energy

The integration of renewable energy with agriculture production system will have better opportunity to realize the aim of national food and energy security. As a pilot program, Smart Greenhouse Technologies powered by the alternative renewable energy resources like solar PV, Solar Thermal, Energy-storage systems. Light Emitting Diodes (LEDs) and smart control system that are not impacted by the climate change in its operation and production will be implemented as follows with the aim to produce year round production especially focusing on the high value vegetable production under protected cultivation with water use efficient technologies (smart irrigation system). The major vegetables that will be grown under the protected cultivation

will be on temporarily import banned vegetables (Chili, Beans, Cauliflower) and vegetables that are imported in huge quantities especially during winter season (like Tomato, Onion). Besides these vegetables, export potential and high value vegetables will be produced.

2.2.1. Establish small size (100 m^2) at household level – with fabricated poly-houses (5x10 m), drip & fertigation system installed, insect proof net and energy required for the system (especially pumping of water for drip irrigation) met from solar energy by installing solar PV and solar thermal system for energy and heat generation. Promotion of poly-house dryer and processing plants at household level.

2.2.2. Establish medium size (500 m^2), which will be focused in farmer groups or youth groups. Forced ventilated fan and pad system Greenhouses with controlled temperature and humidity, misting/fogging system, air heating, insect proof net.

2.2.3. Establish large scale (>1000 m^2) will be established in Farm Machinery Corporation Limited (FMCL) farms. Installation of Hi-Tech Greenhouse (Multi span forced ventilated fan and pad system with all the climate control system).

Component 3: Encourage and establish enterprise development opportunities for communities

3.1.1. Establish community centre
3.1.2. Training workshop for youth and project beneficiaries on organic vegetable farming
3.1.3. Workshops with stakeholders
3.1.4. Documentation and dissemination of best practices & lessons learnt to other areas/communities

B. *Describe how the project / programme provides economic, social and environmental benefits, with particular reference to the most vulnerable communities, and vulnerable groups within communities, including gender considerations. Describe how the project / programme will avoid or mitigate negative impacts, in compliance with the Environmental and Social Policy of the Adaptation Fund.*

Agriculture, responsible for growing food, is major user of water (more than 70% of all water use globally) and energy. Freshwater, once abundant, is undergoing stresses due to increased demand for competing uses and growing uncertainty due to climate change in most of South Asia. There are also several reported cases of spring water getting dried up in different parts of Bhutan mostly attributable to climate change and partly to human induced activities, which adversely affect the food production and hydropower generation capacity. The relationships among food, energy and water are dynamic. Actions in one area usually have impacts in one or both of the others, with profound economic, environmental, and social implications. Use of renewable energy technologies like solar PV, solar thermal system and light emitting diodes is expected to be more cost effective in promoting climate smart farming system and ensure food security under impending climate change scenario.

Due to unfavorable climate condition, the farming activities are seasonal and hence the produces are insufficient to meet the growing demand despite best effort by the Government. During off-season, the food supplies like vegetables are imported from the neighboring countries, which are unsustainable for the Country. Therefore, reliance on green technologies for growing all-year-round food crops would go a long way in building up the national climate resilience and self-reliance. The introduction of green energy smart farming technologies at three strategic level of production scale is expected to address the following:

1. State-owned-enterprise: The large-scale green energy smart farming technology is proposed to pursue by engaging state-owned-enterprises like FMCL. Currently FMCL takes unutilized land on lease and undertake large scale farming activities. Introduction of green energy smart farming technology under state-owned-enterprise will allow large-scale vegetables to meet the high volume demand in the urban centers and cities. The impact of this intervention would be the reduction of food imports, enhanced availability of organically homegrown food supplies and economic well being of the Country.

2. Cooperatives/Youth Groups: The medium–scale green energy smart farming technology is proposed to take up with village cooperatives and youth groups. These will allow production of farm produces to feed the local regional demand. The impact of this intervention at the community level will be the increase farm produce; more income generated from sale of surplus produce, and enhanced economic independence.

3. Progressive and vulnerable farmers: The small-scale green energy smart technologies will be pursued through progressive farmers who are willing to take up and focusing on vulnerable groups of farmers. The impact of such intervention will be enhanced level of food sufficiency at the household level, more income through sale of surplus product, more nutritious intake, better health, more content life and build up resilience to climate change impacts.

4. Installation of grid connected 3 MW solar power plant will ensure 1500 families being guaranteed power supply from solar power in the event that hydroelectricity cannot meet the demand due to constrained power generation owing to climate change.

5. Installation of grid connected of 2 MW will ensure 1000 families of guaranteed power supply from the wind in the event that hydroelectricity cannot meet the growing demand due to adverse effects of climate change.

6. Capacity building measures would ensure enhancement of the institutional strength to sustain the project benefits and to build up the national resilience against the adverse effects of the climate change.

The beneficiaries for this proposed project are at two levels. One is at the national level in which the renewable energy will be injected into the national grid from solar and wind farms and supplied to the people of Bhutan via the national transmission and distribution system. This injection of power from the alternative energy sources will be highly valued in the event the hydropower generation dips down due to hydrological regime change triggered by the climate change. The other is beneficiaries will be at the community level through the introduction of alternative energy based agricultural production technologies. The introduction of RE based green house technologies is expected to motivate the communities to switch farming practices from conventional methods to more climate smart technologies.

The project will target the following beneficiaries;

<u>Rubesa:</u>
Most vulnerable - 10 percent of the households
Vulnerable – 30 percent of the households
Others - 70 percent of the households

Shingkhar, Ura:
Most vulnerable - 15 percent of the households
Vulnerable – 25 percent of the households
Others - 60 percent of the households

It may also be noted that this project is not aimed at addressing only specific section of society. The larger aim of the Project is to address the national-level issues under which, women, marginalized and vulnerable groups are adequately taken care in a systemic manner.

As far as the compliance with the environmental, social and gender policy of the fund is concerned, the existing laws of the land assure the fulfilment. For example, the Environment Act of Bhutan requires the environmental clearances are secured before implementation or execution of the Project on the proposed site. The competent authority only issues the environmental clearance if the concerned local governments and communities have issued their consent for the proposed project. In view of above, noncompliance to above policy requirements of the fund is not anticipated.

The Electricity Act of Bhutan requires the licence to generate power and distribute power in the Country. Therefore, these proposed renewable power plants (solar and wind) shall be built by engaging Bhutan Power Corporation-the only licensed utility company in the Country. After the project is completed, the operation of the project will be handed over to Bhutan Power Corporation. The tariff approved by the electricity regulating authority called Bhutan Electricity will ensure that approved tariff covers the cost of operation, maintenance, spare parts and other requirement as per the law of the land.

C. *Describe or provide an analysis of the cost-effectiveness of the proposed project / programme.*

The import of vegetables takes place mostly in the winter season when there is not much production from within the Country. The major vegetables imported are tomato, onion, cabbage, lettuce, chilies and legumes and are mostly imported from India across the border. The annual import of vegetables has been in increasing trend and on an average from 2006 to 2017 the country has been importing 11,683 MT of vegetables with an outflow of Bhutanese Ngultrum (Nu.) 178.58 million. The 2017 data indicates that there was import of 10,587.25 MT of vegetables worth Nu. 213.59 million. The trend shows steady growth as the demand continues to grow in the country. If these interventions are not pursued at the earliest, increased imports are anticipated, which will not be sustainable in the long run. These interventions will enable to grow food crops under any climate condition and indicating the clear case of climate resilience for sustaining the socio-economic growth in the long run.

Further, electricity supply in the Country is supplied from the hydropower plants. However, to ensure energy security to pursue green economy in the Country amid drying up of spring water sources that feed large river system where large hydropower plants have been built, the development of solar and wind farms is assessed to be more strategic intervention. Considering the gestation period of such renewable energy farms being short compared to hydropower plants, which takes over decade, the development of solar and wind farms are seen to be cost effective.

S#	Component details	Indicative cost (USD) Million
(i) Diversification and exploration of alternate Energy Component		
1	**Solar Sub-Component**	
1.1	Solar modules and accessories	4,500,000.00
1.2	Project execution	250,000
	Total for solar PV-component	4,750,000
2	**Wind Power Sub-component**	
2.1	Wind turbines and accessories 2 MW	**7,000,000.00**
2.2	Power Evacuation network	**150,000.00**
2.3	Project execution	**220,000.00**
	Total for wind power component	**7,370,000.00**
3	**Decentralised Solar System**	
3.1	Solar PV and other accessories	800,000.00
	Total for decentralized system	**800,000.00**
(ii) Enhancing crop production and Productivity		
	Crop production and productivity	**800,000.00**
	MoAF to elaborate	
(iii) Encouragement and establishment of enterprise opportunities		
	Enterprise development activities	**900,000.00**
	MoAF to elaborate	

The cost of developing 3 MW of solar power plant is estimated at USD 4.7 Million, while the cost of developing 2 MW of wind is estimated at USD 4.6 Million. It may be noted that the development of 5 MW of RE entails, site development, control rooms, dedicated power evacuation lines since this type of projects are being developed for the first time. Nevertheless, the cost estimates are within the expected price considering the scale and other local logistical constraints. The greenhouse cost and production technologies are expected to cost another USD 2.5 Million.

In the neighbouring states, India is one country where renewable energy projects are being promoted in massive scale. Since these RE projects (solar and wind) are being developed in several MW capacities, the cost of renewable energy projects in Bhutan, which is just below 5 MW, cannot be compared. However, with the lessons learned from this AF Project, the Country hopes to be able to scale up the project to its full potential.

It is to be noted that the proposed project approach aims to address the key adaptation challenges that go beyond identification of other viable alternatives and justifying the cost effectiveness. Having secured, reliable and affordable energy supply system forms is seen to be one of the most important and effective adaptation measures for the Country. Whether for adapting to colder or the hotter climate conditions or the production or storage of food supplies, adequate energy is required to be secured. Therefore, the proposed project makes an attempt to contribute to diversifying the energy supply mix that capitalizes the adversity of climate change by switching energy from conventional sources to non-conventional renewable energy sources like solar and wind. This project is also aimed to contribute in understanding the RE development issues and frame better enabling environment to mainstream renewable energy development for building national climate resilience.

D. *Describe how the project / programme is consistent with national or sub-national sustainable development strategies, including, where appropriate, national or sub-national development plans,*

poverty reduction strategies, national communications, or national adaptation programs of action, or other relevant instruments, where they exist.

The unique concept of GNH is being pursued by the Royal Government of Bhutan as its development philosophy, which reflects its sensitivity towards the preservation of its rich cultural heritage and pristine environment while ensuring economic growth and overall well being of its people. The 12th Five Year Plan (FYP) covers the period 1st July 2018 to 30th June 2023. The Plan objective and the National Key Results Areas have been anchored and drawn on from the timeless vision and wisdom emanating from the Golden Throne through His Majesty's addresses at different occasions over the last ten years as well as the aspirations and mandates from the Constitution of Bhutan. Additionally, they are also based on the international and regional goals and commitments like the Sustainable Development Goals, to which Bhutan is a party and desk reviews of vision documents like the Vision 2020, Strategy for GNH etc. The 12 National Key Result Areas of 12th Plan is provided in table 1.

Table 1: National Key Result Areas of the 12th plan

1. Macroeconomic Stability Ensured	5. Healthy Ecosystem Services Maintained	9. Efficiency and Effectiveness of Public Services Improved	13. Democracy and Decentralization Strengthened
2. Economic Diversity and Productivity Enhanced	6. Carbon Neutral, Climate and Disaster Resilient Development Enhanced	10. Gender Equality, Women and Girls Empowered	14. Healthy, Safe and Caring Society Sustained
3. Poverty and Inequality Reduced	7. Quality of Education and Skills Improved	11. Productive and Gainful Employment Created	1. Livability and Sustainability of Human Settlements Improved
4. Culture and Traditions Preserved and Promoted	8. Food and Nutrition Security Enhanced	12. Corruption Reduced	2. Justice Services Improved

The objective of the 12th FYP is "Just, Harmonious and Sustainable Society through enhanced Decentralization" and the proposed project is linked to following Sustainable Development Goals (SDGs), National Key Results Areas (NKRAs) and Agency Key Result Areas (AKRAs) of the 12 Five Year Plan (2018-2023) of RGoB.

The project is aimed towards achievement of the following 4 SDGs and linkages with other SDGs prioritized by Bhutan out of the 17 SDGs:

Goal 1: No Poverty

Goal 7: Affordable and Clean Energy

Goal 13: Climate Action
Goal 15: Life on Land

Out of 16 NKRAs identified for 12 FYP, the proposed project is directly linked to the following 7 NKRAs:
NKRA 1: Macroeconomics Stability Ensured.
NKRA 2: Economic Diversity and Productivity Enhanced.
NKRA 3: Poverty Eradicated and Inequality Reduced.
NKRA 6: Carbon Neutral, Climate and Disaster Resilient Development Enhanced.
NKRA 8: Water, Food and Nutrition Security Ensured.
NKRA 9: Gender Equality Promoted, Women and Girls Empowered.
NKRA 10: Productive and Gainful Employment Created

The proposed project is linked to the following AKRAs of Ministry of Agriculture and Forests;
AKRA 1: Enhanced National Food Self Sufficiency.
AKRA 2: RNR (Renewable Natural Resources) Marketing and Value Chain Development Enhanced.
AKRA 4: Enhanced Climate Smart and Disaster Resilient Development.
AKRA 5: Increased RNR sector Contribution to National Economy.

Similarly, the project is linked to the following AKRAs of Ministry of Economic Affairs;
AKRA 1: Economic Growth Sustained.
AKRA 2: Jobs created.
AKRA 3: Promote clean and renewable energy through climate mechanism

In order to realize the SDG 7 (Affordable and clean energy), contribute to NKRA 6(Carbon neutral, climate & disaster resilient development enhanced) and contribute to AKRA 3 (promote clean and renewable energy through climate mechanism), the Ministry has proposed for development of 3 MW solar power plant, 2 MW wind power plant and other relevant technologies in the 12 FYP.

Among others, the INDCs submitted by the Royal Government of Bhutan has identified (i) promotion of clean renewable and climate resilient energy generation by diversifying energy supply mix through promotion of renewable energy (solar, wind, small hydro, biomass) and creating investment opportunities and (ii) promotion of climate resilient agriculture to contribute towards achieving food and nutrition security. Therefore, the proposed project is in full alignment with Country's NDCs to Paris Agreement and NAPA.

E. *Describe how the project / programme meets relevant national technical standards, where applicable, such as standards for environmental assessment, building codes, etc., and complies with the Environmental and Social Policy of the Adaptation Fund.*

From the construction of the Greenhouse sheds, no environmental impact is foreseen irrespective of the sizes. However, for the installation and commissioning of the solar and wind power plants, the Environment Impact Assessment will be carried out in line with Environment Assessment Act 2000 and the Regulation for the Environment Clearance of the Projects (RECP 2002).

The RGoB has already installed 2 numbers of 300 KW wind power plant at Rubesa, Wangdi, which is at the vicinity of the proposed wind power project site. The technical specifications are in place and follows

international standard. However, depending upon the logistical convenience to transport the wind turbines, larger turbine capacity will be explored to optimize the benefit. As for solar power plant is concerned, it is a mature technology and will be following the international standards. While 15 km long 11 KV lines will required to be constructed from the wind farm to the nearest subs-station for evacuating the power generation, the solar power project will only require the desired power conditioning unit to synchronize with the grid power. However, for agriculture component, distributed solar power system will be installed for powering the greenhouse technologies and processing plants that are not connected to grid electricity.

F. *Describe if there is duplication of project / programme with other funding sources, if any*.
The activities proposed in this project will not have any duplication with other projects or initiatives. Rather, there might be several programs and projects the executing agencies might implement in which the proposed project will seek complementarity. The table below shows some of the projects that are planned for implementation during the 12 FYP.

S#	Project description	Objective	Units	Baseline	Target 12 FYP
1	National Biogas Programme	Reduce LPG imports	Nos	5000	4400
2	Improved Cook stoves	Reduce fuel-wood consumption	Nos	14000	3000
3	Solar water heating system	Reduce electricity consumption	System	12	65
4	Installed capacity of solar Power	Diversity supply mix	kW	82 kW	3,000 KW
5	Installed capacity of wind power	Diversify supply mix	kW	600 kW	2,000 kW

It may be noted that above projects have more than one objectives but only primary objective have been reflected in this Report.

G. *If applicable, describe the learning and knowledge management component to capture and disseminate lessons learned.*

The project on "Harnessing Alternative Renewable Energy Resources for Enhancing Community Resilience and Sustainable Food Security for Adaptation to Climate Change" will be implemented as pilot project under the banner of flagship programme. The Ministry of Agriculture & Forests and the Ministry of Economic Affairs will be the executing agencies taking lead on its relevant components. The lessons learned from this AF project will capture through progress, annual and evaluation reports that will be tabled at the Project Steering Committees for deliberation on regular basis.

The dissemination of knowledge will be done through national workshops and meetings. Also, the national broadcasting service will be invited at the project sites for capturing the project activities and broadcasting at national level. NIE will ensure experience sharing through newsletter and forums to other related parties.

H. *Describe the consultative process, including the list of stakeholders consulted, undertaken during project preparation, with particular reference to vulnerable groups, including gender considerations, in compliance with the Environmental and Social Policy of the Adaptation Fund.*

The consultation process has undertaken at three different levels. The first level of consultation has been between the Ministry of Agriculture & Forests and the Ministry of Economic Affairs on this project concept.

The second level of consultation has been between the respective ministries and their sister agencies like FMCL, cooperatives/groups and Bhutan Power Corporation Limited. The third level of consultation has been with the Ministry and the people at the project sites. As for development of wind and solar power plants, communities have been consulted and their consents have been obtained. Currently, solar meteorological station and 50 m wind mast have been installed to measure the solar and wind resource data at the project sites.

It is to reiterate that the initial consultations have been carried out with the concerned local district administration and communities of Shingkhar under Bumthang district where 3 MW solar power plant is being proposed. The same has also been carried out with the concerned local administration and community at Rubesa, Wangdi where 2 MW of wind power plants are being proposed.

In addition, thorough consultations with the relevant stakeholders and the communities will be carried out once the project concept is approved by the Adaptation Fund.

I. *Provide justification for funding requested, focusing on the full cost of adaptation reasoning.*

Possibly due to demographical changes and adverse impacts of climate change, the import of off-season vegetables is on increasing trend, which is not only unsustainable but also makes the nation more vulnerable to external shocks of geo-economic politics. While efforts are being made at all possible levels to enhance the food self sufficiency, adverse effects of climate change continue to pose serious challenge to attain this self-reliance goal unless new technologies are embraced.

Further, Bhutan's ability to export electricity is declining trend due to increased energy consumption within the Country and is expected to continue if there is no capacity addition or there is hydrological regime change resulting low water flows in the river system. There has been several reported case of spring water getting dried up in different parts of the Country mostly attributable to climate change and partly to human induced activities. Since spring water system feed to the larger rivers where large hydropower plants have been built, drying of water sources or extended period of draught would have significant effect on the hydropower generation capacity, hence the revenue generation and Country's economic vulnerability.

Therefore, as a national contingency plan and to sustain the economic growth under impending climate change, there is an urgent need to diversify the energy supply mix using other forms of renewable energy that are not water dependent. If corrective measures are not taken in time, the import electricity might become necessary and have adverse impact on the competitiveness of our local industries.

Following are expected scenarios:

1. The continuously drying up of spring water, which serves as critical and important source of water for drinking, irrigation and hydropower production, will have significant impact on the live and livelihood of the people for not being able to grow adequate food nor bank of adaptation technologies as more affordable power supply would be required.
2. The hydropower generation would decline due to low levels of water in the river system where large hydropower plant have been built and hence not able to generate much energy that would be needed to power the technologies (heating, cooling, storage systems) to enhance the adaptive capacity.
3. This would potentially lead to import of energy from outside Bhutan. Increased dependence on imported energy would make the country economically more vulnerable.

4. Presently agriculture being dependent on rain fed system, the project will attempt to establish protected agriculture that will have limited climate change influence in its production due to controlled environment.

Therefore, this project is aimed to address the above issues by diversifying energy supply mix and harness alternate renewable energy resources for enhancing community resilience for sustainable food security.

J. *Describe how the sustainability of the project/programme outcomes has been taken into account when designing the project / programme*.

Sustainability has been considered as the guiding principle from the very beginning when defining objectives, expected outcomes, outputs and activities of the project. The sustainability of the project outcomes will be ensured through a close collaboration with communities/beneficiaries and make sure that their needs in terms of adaptation to climate change and variability have been properly considered. In order to ensure proper O&M of the equipment, wherever possible, domestic firm/companies will be encouraged to participate for supply of equipment and construction. Capacity development at multiple levels (institutions and communities) would ensure that the programme results sustained in the long run. The design of the project will ensure that there is high acceptance by the local community and in fact community themselves becomes the part of the project ownership. Therefore, their involvement from the beginning is critical to achieve this objective. During the consultation process, the social conditions will be carefully analysed and strategies defined to achieve long-term acceptance and support by the local community.

In particular, the grid connected solar PV and wind power generation facilities will be operated and maintained by a licensed utility company called Bhutan Power Corporation. The Bhutan Electricity Authority, which is regulatory agency, will ensure that the approved tariff covers the cost of operation, maintenance, spare parts and labour cost stretching to its economy life.

It is also to state that the initial investment cost required for the proposed project is proposed to finance by the AF. However, the Government will cover cost of operation and maintenance and sustain the plant through the cost recovery mechanism from the sale of electricity to the citizens in the country.

K. Provide an overview of the environmental and social impacts and risks identified as being relevant to the project / programme.

Checklist of environmental and social principles	No further assessment required for compliance	Potential impacts and risks –further assessment and management required for compliance
Compliance with the Law	The project will be implemented in compliance with applicable national and international laws	None
Access and Equity	Access inequalities issues will not arise	None
Marginalized and Vulnerable Groups	None	Impact on these groups will be positive and they will be strongly involved during the implementation of the project
Human Rights	The project will be implemented in compliance to human right	None
Gender Equity and Women's Empowerment	None	There will be no gender inequality, however, women will be targeted for empowerment
Core Labour Rights	The project will be implemented as per the national labour law	None
Indigenous Peoples		The target will be for indigenous people
Involuntary Resettlement	The resettlement issue will not arise	None
Protection of Natural Habitats	The natural habitats will be protected	None
Conservation of Biological Diversity	Biological diversity will be conserved	None
Climate Change	None	The project will reduce GHG level
Pollution Prevention and Resource Efficiency	None	The project will have positive impact on pollution
Public Health	None	The health of general public will be improved through organic farming
Physical and Cultural Heritage	Cultural heritage will not be affected	None

PART III: IMPLEMENTATION ARRANGEMENTS

A. Describe the arrangements for project / programme implementation.

The Department of Renewable Energy, Ministry of Economic Affairs, Royal Government of Bhutan and the Department of Agriculture, Ministry of Agriculture and Forests will be the executing agencies for respective components and the implementing agencies will be its subsidiary/relevant agencies like Bhutan Power Corporation for the Solar and Wind power projects and Agriculture Research and Development Centers, Farm Machinery Corporation Limited and Agricultural cooperatives for the Green Energy Smart Farming Technology component.

Project Steering Committee (PSC) will be established, which will oversee and provide strategic guidance for the implementation of the project. The PSC will be chaired by the Director, Gross National Happiness Commission and Co-chair by the Director, Bhutan Trust Fund for Environmental Conservation and will be composed of representatives from relevant agencies.

The Project Management Units (PMU) will be established within the implementing agencies for the day-to-day implementation, coordination and monitoring of the project.

B. *Describe the measures for financial and project / programme risk management.*

The table below identifies the main risks that the project management may face during the implementation of the project and provides possible mitigation measures to address these risks.

Risk	Mitigation measures
Delays in the disbursement of fund may affect the project progress	Appropriate mechanism will be in placed for the timely release of fund
Ineffective management of project funds may affect project implementation.	Trained staff in relevant field will be assigned for the project
Loss of private farming land	Compensation at the market price
Lack of coordination among executing and implementing agencies may affect the progress of the project	Periodic meetings among the agencies will be held to fast track the project implementation.
Long term sustainability of the project	The executing and implementing agencies will make sure that local communities will be engaged and enhance their capacities

C. *Describe the measures for environmental and social risk management, in line with the Environmental and Social Policy of the Adaptation Fund.*

As mentioned above, from the construction activities of Greenhouse shed, no environmental damage is foreseen and hence requirement of environmental risk management is not felt.

In general, the development of renewable energy is considered as environment friendly project contributing to reduction of GHG emission. However, since the development involve various activities including construction, Environment Impact Assessment will be carried out. The environmental management plan will also be prepared as an integral part of the project to set out the procedural framework for ensuring the implementation of all mitigation measures. The environmental monitoring plan will include description of type of monitoring parameters, risk involved and scheduled for monitoring to ensure implementation of mitigation measures.

D. *Describe the monitoring and evaluation arrangements and provide a budgeted M&E plan.*

Monitoring and evaluation (M&E) will be part of the regular M&E system and will be carried out in line with the guidelines of the Bhutan Trust Fund for Environmental Conservation and the adaptation fund. M&E activities will be carried out based on the logical results framework, which will be developed at the next stage of the proposal.

A mid-term evaluation will be carried out on the effectiveness and efficiency and where necessary, corrective action will be taken for successful implementation of the project. The Final Evaluation will occur at the end of the project and will be based on the same approach as the mid-term evaluation. An ex-post evaluation will be undertaken, that would provide on assessing the sustainability of project results, lessons learned including best practices for replication

E. Include a results framework for the project proposal, including milestones, targets and indicators.

Objective/ Output/ Outcome	Indicator	Baseline	Target	Means of verification
To diversify alternative green energy resources to enhance climate resilience and sustainable food security for adaptation to climate change	Capacity of alternative renewable energy	600 kW	5 MW	Installation and commissioning report
	-Area under protected cultivation powered by alternative green energy - No of post production facilities	None None	- Progress household level (10,000m^2) - Cooperates/Youth group (2500 m^2) - State owned enterprise (2000m^2) 3 Nos	Project completion report
Component 1: Diversification and exploration of Alternative Green Energy Resources				
Outcome 1: Guaranteed energy supply for households and contributed to energy security	Capacity of alternative renewable energy	Wind- 600kW Solar – 82 kW Small scale solar – 82 kW	Solar – 3 MW Wind – 2 MW Small scale solar- 1.2 MW	Installation and commissioning report
Output 1.1: Solar power plant installed and commissioned	Capacity of solar power plant	82 kW	3 MW	Installation and commissioning report
Output 1.2: Wind power plant installed and commissioned	Capacity of wind power plant	600 kW	1 MW	Installation and commissioning report
Output 1.3: Captive solar power plants installed and commissioned	Capacity of solar captive power plant	82 kW	MW	Installation and commissioning report
Component 2: Enhance crop production and productivity for food security and import substitution				

Outcome 2.1: Demonstrated effective use of RE for intensive farming (for climate control, irrigation, processing, heat supply, etc.)	Area under protected cultivation powered by alternative green energy	None	- Progress household level (10,000m^2) - Cooperates/Youth group (2500 m^2) - State owned enterprise (2000m^2)	Project completion report
Outcome 2.2: Enhanced year round production of high value crops for domestic and export market	Number of post-production facilities	None	3 Nos	
Output 2: Different level of protected cultivation structures established.	Area under protected cultivation powered by alternative green	None	- Progress household level (10,000m^2) - Cooperates/Youth group (2500 m^2) - State owned enterprise (2000m^2)	
Component 3: Encourage and establish enterprise development opportunities for communities				
Outcome 3: Business opportunities created for private enterprises or youth in agriculture	Number of youth in business activities	0	No. of youth	Project completion document
Output 3: Knowledge and skills of all the stakeholders enhanced	Number of youth trained	0	No of youth	Project completion document

F. Demonstrate how the project / programme aligns with the Results Framework of the Adaptation Fund

Project Objective(s)[1]	Project Objective Indicator(s)	Fund Outcome	Fund Outcome Indicator
To diversify alternative green energy resources to enhance climate resilience and sustainable food security for adaptation to climate change	- Capacity of alternative renewable energy - Area under protected cultivation powered by alternative green energy - No of post production facilities	Outcome 4: Increased adaptive capacity within relevant development and natural resources	4.2 Physical infrastructure improved to withstand climate change and variability-induced stress
Project Outcome(s)	**Project Outcome Indicator(s)**	**Fund Output**	**Fund Output Indicator**
Outcome 1: Guaranteed energy supply for households and contributed to energy	Capacity of alternative renewable energy	Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)

[1] The AF utilized OECD/DAC terminology for its results framework. Project proponents may use different terminology but the overall principle should still apply

Outcome 1: Guaranteed energy supply for households and contributed to energy	Capacity of alternative renewable energy	Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	10,000,000
Outcome 2.1: Demonstrated effective use of RE for intensive farming (for climate control, irrigation, processing, heat supply, etc.)	Number of post-production facilities	Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	3,500,000
Outcome 2.2: Enhanced year round production of high value crops for domestic and export market	Area under protected cultivation powered by alternative green	Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability	4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)	

Outcome 3: Business opportunities created for private enterprises or youth in agriculture	Number of youth trained Number of youth in business activities	Output 2.1: Strengthened capacity of national and regional centres and network	2.1.1. No. of staff trained to respond to, and mitigate impacts of, climate-related events	400,000

G. Include a detailed budget with budget notes, a budget on the Implementing Entity management fee use, and an explanation and a breakdown of the execution costs.

To be detailed at the next stage of the proposal.

H. Include a disbursement schedule with time-bound milestones.

To be provided at the next stage of the proposal.

PART IV: ENDORSEMENT BY GOVERNMENT AND CERTIFICATION BY THE IMPLEMENTING ENTITY

A. *Record of endorsement on behalf of the government*[2] *Provide the name and position of the government official and indicate date of endorsement. If this is a regional project/programme, list the endorsing officials all the participating countries. The endorsement letter(s) should be attached as an annex to the project/programme proposal. Please attach the endorsement letter(s) with this template; add as many participating governments if a regional project/programme:*

(Enter Name, Position, Ministry)	Date*: (Month, day, year)*

B. *Implementing Entity certification* *Provide the name and signature of the Implementing Entity Coordinator and the date of signature. Provide also the project/programme contact person's name, telephone number and email address*

I certify that this proposal has been prepared in accordance with guidelines provided by the Adaptation Fund Board, and prevailing National Development and Adaptation Plans (…….list here…..) and subject to the approval by the Adaptation Fund Board,commit to implementing the project/programme in compliance with the Environmental and Social Policy of the Adaptation Fund and on the understanding that the Implementing Entity will be fully (legally and financially) responsible for the implementation of this project/programme.	
Name & Signature Implementing Entity Coordinator	
Date: *(Month, Day, Year)*	Tel. and email:
Project Contact Person:	
Tel. And Email:	

[2] Each Party shall designate and communicate to the secretariat the authority that will endorse on behalf of the national government the projects and programmes proposed by the implementing entities.

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རྒྱལ་ཡོངས་དགའ་སྤྱིད་དཔལ་འཛོམས་ལྡན་ཚོགས།།
Royal Government of Bhutan
Gross National Happiness Commission

GNHC/DCD/AF/2018/ 2275

[25th July 2018]

To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

Subject: Endorsement for Harnessing Alternative Renewable Energy Resources for Enhancing Community Resilience and Sustainable Food Security for Adaptation to Climate Change

In my capacity as designated authority for the Adaptation Fund in Bhutan, I confirm that the above national project proposal is in accordance with the government's national priorities in implementing adaptation activities to reduce adverse impacts of, and risks, posed by climate change in Bhutan.

Accordingly, I am pleased to endorse the above project proposal with support from the Adaptation Fund. If approved, the project will be implemented by Bhutan Trust Fund for Environmental Conservation and executed by Ministry of Economic Affairs and Ministry of Agriculture and Forests.

Sincerely,

Director
Gross National Happiness Commission

Rinchen Wangdi
Designated Authority for AF in Bhutan and
Director, Gross National Happiness Commission

P.O Box: 127, Tashichhodzong, Thimphu
PABX – 00975-2-325192/325850/325741/322503/321053. FAX- 00975-2-322928
AFD PABX – 00975-2-333230/333231/333232/333234/326777 FAX – 00975-2-326779
Website: www.gnhc.gov.bt