



ADAPTATION FUND

**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
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Washington, D.C., 20433
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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 15,000,000 (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. It pursues the Gross National Happiness (GNH) as its development philosophy, a new development paradigm shift from use of classical Gross National Product (GDP). GNH approach measures the development progress in more holistic manner. 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.

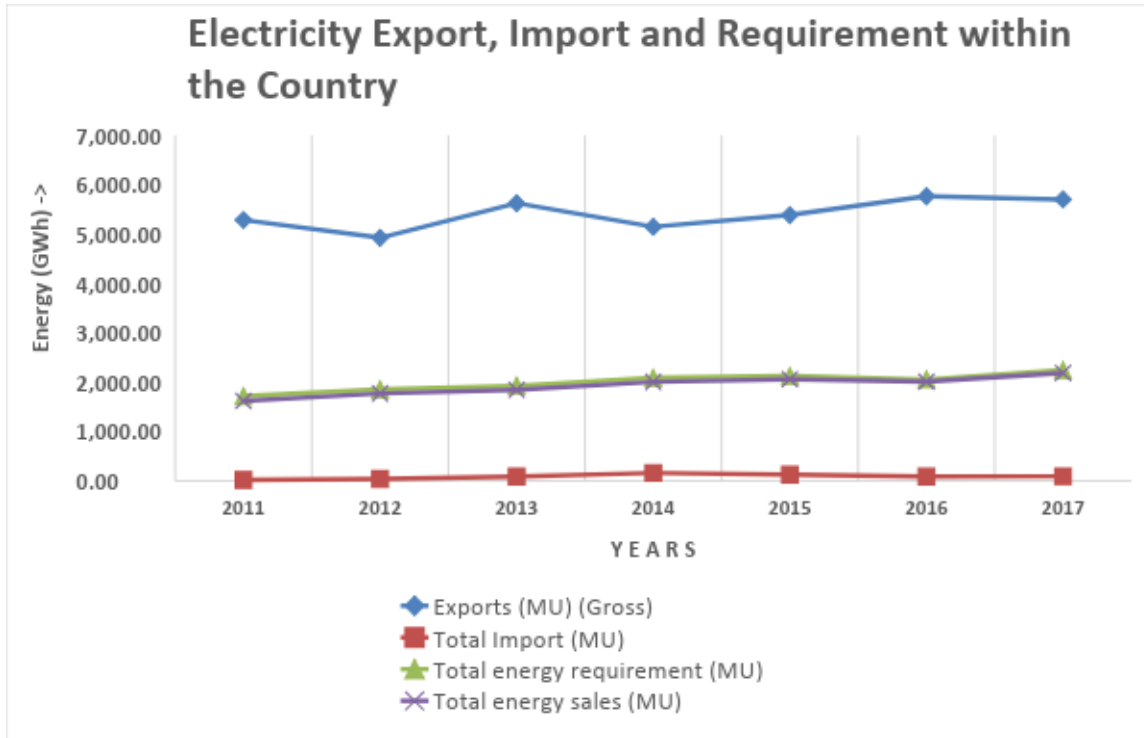


Fig 1: Total energy generated and export/import of electricity

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 diversifying 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 with 43.9% of the employed population are under agriculture sector (PHCB 2017) 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 from using 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 from the pilot project to scale up to meet all its domestic energy demand in the long run which is 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.

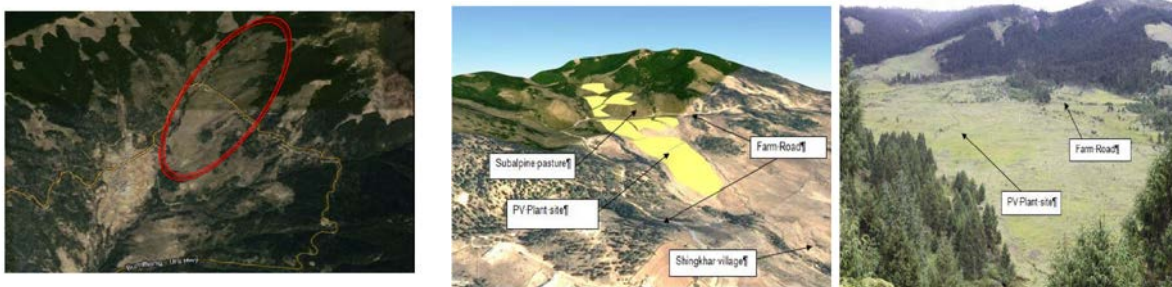


Figure 2: Solar Project site at Shingkhar, Bumthang

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 systems 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 Bhutan 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 rural 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	Protected cultivation structures, storage and processing structures established	<ul style="list-style-type: none"> ● Demonstrated effective use of RE for intensive farming (for climate control, 	3,500,000

security and import substitution		irrigation, processing, heat supply, etc.) <ul style="list-style-type: none"> Enhanced year round production of high value crops for domestic and export market. 	
Component 3: Encourage and establish enterprise development opportunities for communities	<ul style="list-style-type: none"> 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.*

With increasing population (16% increase from 2005-2017 as per PHCB 2017), increasing demand for food, rapid industrialization and economic transformation, increasing rural-urban migration (21.7% of the total population) and the changing global climate, agriculture in Bhutan is confronted with number of challenges. The major challenge faced by the agriculture sector is the impact of climate change as agriculture is highly dependent on climate (e.g. farm productions are highly dependent on perennial streams and timing of the monsoons for irrigation purpose). Consequently, the impacts of climate change on agriculture, and agriculture's ability to adapt to and mitigate the impacts of climate change, are critical issues for agriculture households as well as the general public and public policy decision makers.

To sustain the economy growth under impending climate change, the diversification of energy supply mix using renewable energy resources is assessed to be a strategic measure to build up the national climate resilience.

Proposed Activities

Component 1: Diversification and exploration of Alternative Green Energy Resources

The following activities will be carried out under Component 1:

- 1.1 Installation and commissioning of 3 MW solar power plant**
 - 1.1.1 Finalization of 3 MW solar power plant 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**
 - 1.2.1 Finalization of 2 MW wind power 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 irrigation water available 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 one of the major potato producing districts in the country with a 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 districts, especially for the farming households in the 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 such as 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. This will be done 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 also be produced.

2.2.1. Establish small size (100 m²) 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 m²), 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 m²) 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 a 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, which adversely affect the hydropower generation capacity and then food production as suggested by the dynamic relationship among water, energy and food. Actions in one area usually have impact(s) in one or both of the others, with profound economic, environmental, and social implications. Use of renewable energy technologies such as solar PV, solar thermal system and light emitting diodes is expected to be more cost effective in promoting climate smart farming system and ensuring food security under impending climate change scenario.

Due to unfavorable climate condition, the farming activities are seasonal and hence the produce are insufficient to meet the growing demand despite best effort by the Government. During off-season, the food supplies such as vegetables are imported from the neighboring countries, which is not sustainable in long run 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 produce to feed the local regional demand. The impact of this intervention at the community level will be the increased 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 focus 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 produce 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 implementation of this project will be executed only after securing the environmental clearance and will ensure that all national safeguards are complied to. On the social front, the value of their assets are going to be enhanced due to increased economic opportunities.

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 which are mostly imported from India across the border. The annual import of vegetables has been an 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.

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	15. Livability and Sustainability of Human Settlements Improved
4. Culture and Traditions Preserved and Promoted	8. Food and Nutrition Security Enhanced	12. Corruption Reduced	16. 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.

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

Similarly, the proposed project is linked to the Local Government Key Result Areas of Bumthang and Wangdue Phodrang districts:

LGKRA 1: gainful employment created and local economy enhanced
LGKRA2: Food and nutrition security enhanced
LGKRA9: carbon neutral, climate change and disaster resilient development enhanced
LGKRA 10: Gender equality promoted, women and girls empowered

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.

- 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).

- 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.

- 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 success of the projects will be disseminated across the Country.

- 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 such as 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.

After the funds have been secured, another round of consultation especially targeting the needs of the vulnerable group and gender will be carried out with the communities from the project sites. Further, the community will be communicated on the project content and the implementation framework.

- 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 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.

- 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 safeguards & strategies will be put in placed to achieve long-term acceptance and support by the local community.

- 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
<i>Compliance with the Law</i>	The project will be implemented in compliance with applicable national and international laws	None
<i>Access and Equity</i>	Access inequalities issues will not arise	None
<i>Marginalized and Vulnerable Groups</i>	None	Impact on these groups will be positive and they will be strongly involved during the implementation of the project
<i>Human Rights</i>	The project will be implemented in compliance to human right	None
<i>Gender Equity and Women's Empowerment</i>	None	There will be no gender inequality, however, women will be targeted for empowerment
<i>Core Labour Rights</i>	The project will be implemented as per the national labour law	None
<i>Indigenous Peoples</i>		The target will be for indigenous people
<i>Involuntary Resettlement</i>	The resettlement issue will not arise	None
<i>Protection of Natural Habitats</i>	The natural habitats will be protected	None
<i>Conservation of Biological Diversity</i>	Biological diversity will be conserved	None
<i>Climate Change</i>	None	The project will reduce GHG level
<i>Pollution Prevention and Resource Efficiency</i>	None	The project will have positive impact on pollution
<i>Public Health</i>	None	The health of general public will be improved through organic farming
<i>Physical and Cultural Heritage</i>	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 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 place 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	<ul style="list-style-type: none"> - 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

<p>Outcome 1: Guaranteed energy supply for households and contributed to energy</p>	<p>Capacity of alternative renewable energy</p>	<p>Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability</p>	<p>4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)</p>	<p>10,000,000</p>
<p>Outcome 2.1: Demonstrated effective use of RE for intensive farming (for climate control, irrigation, processing, heat supply, etc.)</p>	<p>Number of post-production facilities</p>	<p>Output 4: Vulnerable physical, natural, and social assets strengthened in response to climate change impacts, including variability</p>	<p>4.1.2. No. of physical assets strengthened or constructed to withstand conditions resulting from climate variability and change (by asset types)</p>	<p>3,500,000</p>

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 government²** 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:

Rinchen Wangdi DA & Director Gross National Happiness Commission (Enter Name, Position, Ministry)	Date: July 25, 2018
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- 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 (12 th Five Year Plan & National Adaptation Plan of Action-NAPA-III) 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.	
	
Dr. Pema Choephyel (NIE) BhutanTrust Fund for Environmental Conservation Name & Signature Implementing Entity Coordinator	
Date: July 26, 2018	Tel. and email: +975-02-339861 (choephyel@bhantrustfund.bt)
Project Contact Person: Singye Dorji	
Tel. And Email: +975-02-339862 (singye@bhantrustfund.bt)	

²⁶. 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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Royal Government of Bhutan
Gross National Happiness Commission



GNHC/DCD/AF/2018/ 2275

[25th July 2018]

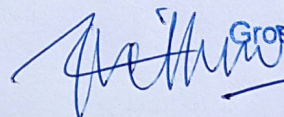
To: The Adaptation Fund Board
c/o Adaptation Fund Board Secretariat
Email: Secretariat@Adaptation-Fund.org
Fax: 202 522 3240/5

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