



Kingdom of Bhutan
Second Nationally Determined Contribution

Royal Government of Bhutan

Thimphu

5th June 2021

Contents

1. Introduction	1
2. Progress on implementing climate action since the INDC and ratification of the Paris Agreement	2
3. Summary of NDC (mitigation component)	5
a) <i>Forest conservation and management under the National REDD+ Strategy</i>	<i>6</i>
b) <i>Low Emission Development Strategy for Food security</i>	<i>7</i>
c) <i>Low Emission Development Strategy for Human Settlement</i>	<i>7</i>
d) <i>Low Emission Development Strategy for Industries</i>	<i>7</i>
e) <i>Low Emission Development Strategy for Surface Transport</i>	<i>8</i>
f) <i>Waste Management</i>	<i>9</i>
g) <i>Sustainable Hydropower Development</i>	<i>9</i>
h) <i>Alternative Renewable Energy</i>	<i>9</i>
i) <i>Green Hydrogen Roadmap</i>	<i>10</i>
j) <i>National Energy Efficiency & Conservation Policy 2019 and Energy Efficiency Roadmap 2019</i>	<i>10</i>
k) <i>Cooperative mechanisms to achieve sustainable development and mitigation ambitions</i>	<i>10</i>
4. Adaptation Component	10
5. Means of Implementation	10
6. Information to facilitate clarity, transparency and understanding of Bhutan's NDC	11
Annex I. Information to facilitate clarity, transparency and understanding of Bhutan's NDC	12

1. Introduction

As a small landlocked country with a fragile mountainous ecosystem, and with high reliance on climate sensitive sectors such as hydropower and agriculture, the Kingdom of Bhutan is particularly vulnerable to the adverse impacts of climate change. Furthermore, as a least developed country, Bhutan lacks the resources and capacity to address the challenges of climate change.

Bhutan submitted its Intended Nationally Determined Contribution (INDC) to the Paris Agreement on 30 September 2015. On ratification of the Paris Agreement on 19 September 2017 the INDC became Bhutan's first NDC. The NDC reaffirmed Bhutan's pledge to remain carbon neutral first made in 2009 and laid out the priorities for low GHG emission development across nine areas. The NDC also contained ten areas of priority needs for adaptation and called on the international community to support Bhutan's efforts to mitigate and adapt to climate change and that *"the successful implementation of our intended actions to mitigate will depend on the level of financial and technical support received"*¹.

The Third National GHG Inventory² shows that Bhutan's greenhouse gas emissions (including forest emissions) in 2015 amounts to just 3.8 million tons of CO₂e, which is negligible on a global scale. In the same year, Bhutan's forests sequestered 9.4 million tons of CO₂ resulting in net negative emissions of 5.6 million tons of CO₂. In this regard, Bhutan continues to remain carbon neutral.

In presenting the 2nd NDC, Bhutan maintains the commitment to remain carbon-neutral and the 2nd NDC is an enhancement from the first NDC in several ways³:

- i) The data and information that demonstrates Bhutan's position as a net carbon sequestering country has been greatly improved. Since the first NDC, the national GHG inventory system has been improved with the completion of the 3rd GHG Inventory where significant improvements have been made with the utilisation of the 2006 IPCC Guidelines.
- ii) Bhutan's forests serve as the cornerstone of our carbon commitment and there has been tremendous improvements in estimation of forest emissions and removals. The data and information for forest emissions and removals have been estimated at a higher tier with the completion of a comprehensive National Forest Inventory in 2016 and the submission of Bhutan's National Forest Reference Emission Level and National Forest Reference Level prepared as part of Bhutan's REDD+ Readiness preparedness.
- iii) The broad plans and actions for low emission development identified in the 1st NDC to support Bhutan's efforts to remain carbon neutral have been further elaborated and refined through low emission development strategies (LEDS), and roadmaps. Therefore, sectoral actions with GHG and non-GHG targets along with strategies and priority plans are now presented in the 2nd NDC.

The COVID-19 pandemic affected the preparation of the second NDC from Bhutan with disruptions and delays to technical work and the consultation process. Despite these challenges, this second NDC from Bhutan has been prepared through an extensive process of technical assessments and wide-ranging stakeholder consultations. The participation of government agencies, stakeholder groups including CSOs, and private sector and support of UNDP's Climate Promise were essential for the process of preparing the NDC under trying and difficult circumstances.

¹ INDC of the Kingdom of Bhutan, 2015

² Third National Communication from the Kingdom of Bhutan to the UNFCCC, 2020

³ Refer Annex 1 on Information to facilitate clarity, transparency and understanding of Bhutan's NDC for further details.

The second NDC charts a way for Bhutan to continue pursuing a low emission development pathway towards our national objectives for sustainable development while meeting our obligations under the Paris Agreement.

2. Progress on implementing climate action since the INDC and ratification of the Paris Agreement

Since the ratification of the Paris Agreement, Bhutan has taken several measures towards implementing the priorities identified in the NDC. The key actions undertaken towards a low emission and carbon resilient development in Bhutan are summarised below:

- Climate change has been integrated into our development planning with “*Climate Neutrality, Climate and Disaster Resilience*” identified as the sixth National Key Result Area (NKRA) of the 12th Five Year Plan (2018-2023). With the five-year plan’s objective as “*Just, Harmonious and Sustainable Society through enhanced Decentralisation*”, the priority areas for mitigation and adaptation in the NDC were developed into programs primarily under this NKRA and other NKRAs for implementation across different sectors at the national and local levels⁴.
- Following the Economic Development Policy 2016, fiscal incentives were provided in the form of direct and indirect tax incentives under the Fiscal Incentives Act of Bhutan 2017 to stimulate economic growth, foster private sector development, and generate employment. Incentives included tax rebates to industries adopting modern environmentally friendly technologies, tax exemptions to hydroelectric projects, solar, wind, biogas and other renewable energy plants and machineries. Energy efficient and environment friendly equipment were also exempted from import duties for targeted sectors such as hotels. Waste management and recycling industries were provided income tax holidays and exemption of sales tax and custom duties on plant and machinery.
- The Climate Change Policy of the Kingdom of Bhutan 2020 was adopted with a vision for “a prosperous, resilient and carbon neutral Bhutan where the pursuit of gross national happiness for the present and future generations is secure under a changing climate.” The policy aims to (i) provide strategic guidance to ensure that Bhutan remains carbon neutral and protect the wellbeing of the people of Bhutan by adapting to climate change in an efficient and effective manner (ii) ensure meaningful participation of all relevant stakeholders in climate change action in a coordinated and coherent manner with clear roles and responsibilities and (iii) ensure that the challenges and opportunities of climate change are addressed at all appropriate levels, through adequate means of implementation (finance, technology, capacity building and awareness) and integration into relevant plans and policies.
- The national institutions for coordination of climate change actions across key agencies and stakeholder groups have been revitalised with the Climate Change Coordination Committee (C4) from the erstwhile Multisectoral Technical Committee on Climate Change. In addition, a climate change ‘one stop platform’ is being set up to help coordinate multi-stakeholder dialogue to develop and implement climate related work in Bhutan, with the aim to improve coordination between the different climate-sensitive sectors, enhance knowledge management and improve reporting and monitoring of all climate actions in Bhutan.
- Bhutan ratified the Kigali Amendments to the Montreal Protocol on Ozone Depleting Substances in 2019 and has put in place the system for licensing the import and export of HFCs. The regulations for Regulation on Control of ODS 2008 are being amended.

⁴ Gross National Happiness Commission (2019): Twelfth Five Year plan 2018-2023, Royal Government of Bhutan, Thimphu.

- The National Energy Efficiency & Conservation Policy, and the Energy Efficiency Roadmap 2030 covering the sectors of buildings, transport and industry were launched in 2019. The policy and roadmap aim to facilitate improvements in productivity and energy efficiency while contributing to Bhutan's efforts to remain carbon neutral. Few of the measures are now being implemented while support is required for full implementation. In addition, the Renewables Readiness Assessment (RRA) has been developed in cooperation with International Renewable Energy Agency with a view to complement the country's efforts in enabling the wider penetration of various renewable energy technologies.
- The Renewable Energy Master Plan (2017-2032) was adopted as a strategy for the long-term implementation of renewable energy technologies. This master plan identified 39,462 MW of technically feasible small hydropower, solar and wind projects across the country. These renewable energy technologies provide a basis for both clean energy generation for mitigation and as adaptation to changing water flows and the impacts on hydropower in Bhutan.
- The Sustainable Hydropower Development Policy (SHDP) 2021 enhances the previous hydropower policy by integrating climate resilience and mitigation among other updates. As current run-of-river hydropower schemes in Bhutan have become increasingly vulnerable to decreasing water flows in the dry season the SHDP emphasises adaptation measures such as reservoir/pumped storage schemes. In addition, the new policy mandates hydropower value chain through ventures in energy storage technologies such as hydrogen fuel, green ammonia, and other emerging technologies. These energy storage and diversification measures for adaptation also contribute directly to Bhutan's carbon neutral efforts by providing clean energy for zero carbon transport and mobility.
- Bhutan's National Environment Strategy 1998, which charted "the middle path" to development and guided the nation's pursuit of balanced sustainable development over the past two decades and precipitated most of Bhutan's environmental policies and measures was updated in 2020. The NES 2020 now integrates new and emerging national environmental challenges and the critical global challenge of climate change. The strategic measures to managing land, air, water, and biodiversity now include climate change as a cross-cutting issue for more holistic integration into relevant policies and programs.
- Bhutan implemented the REDD+ readiness programme and produced Bhutan's National REDD+ Strategy and implementation framework including the National Forest Monitoring System, Forest Reference (Emission) Level, a Monitoring, Reporting and Verification (MRV) Mechanism, and Safeguard Information System (SIS) for REDD+⁵. With the establishment of the National REDD+ Framework, Bhutan is awaiting support to proceed to implementation of the strategy which include policies and measures that will contribute to continued conservation and sustainable management of forest.
- To implement the priority programs in the NDC, several Low Emission Development Strategies (LEDS) were developed to prioritise mitigation actions in key sectors of Agriculture, Human Settlement, Industry and Transport. These LEDS will serve as the basis for the sector to integrate low carbon measures into development priorities. Further support for implementation is required to realise the identified priority programs and actions in the various LEDS.
- A study on Gender and Climate Change in Bhutan with a focus on three NDC sectors of Agriculture, Energy and Waste was undertaken to unpack the gender climate nexus, gender roles and gender differentiated impacts of climate change. The study has been instrumental in informing gender mainstreaming opportunities in the preparation of the LEDS and the 2nd NDC.

⁵ <http://redd.dofps.gov.bt/>

- Three NAMAs were developed in 2016 for Road Transport, Housing (residential and institutional) and Municipal Solid Waste Management. However, securing support to implement the NAMAs has been challenging and the NAMAs have not yet been implemented.
- The Bhutan Electric Vehicle (EV) Roadmap (2020-2025) has also been developed for a transition to zero emission mobility with targets for 2035, 2045 and 2050. The Bhutan Sustainable Low-emission Urban Transport System project is being implemented to initiate the transition to EV mobility by focussing on taxis as the primary target for eventual market transformation.
- The National Waste Management Strategy was adopted in 2019, and the Waste Management and Stray Dog Population Control flagship program launched on January 23, 2020. The overall goal is to achieve Zero Waste Bhutan where the current trend of disposing over 80% of solid waste to the landfill is reversed to less than 20% by the year 2030 based on the principles of circular economy.
- The Renewable Natural Resources (RNR) Strategy 2040, covering the forests, agriculture, and livestock sectors, was adopted in 2021 and covers the AFOLU sector under the IPCC emissions source category. The RNR Strategy integrates resilience to climate change and low emission development as one of the key strategies to actualise transformational change in this integrated sector by building on the REDD+ Strategy, LEDS for Food Security 2021, and the National Strategy for Sustainable Socio-economic Development through the Commercialization of Organic Farming 2019.
- Adaptation planning and implementation are also progressing. The third NAPA project funded by the LDC Fund is being implemented for “Enhancing Sustainability and Climate Resilience of Forest and Agricultural Landscape and Community Livelihoods in Bhutan” (2017-2023). This follows the successful conclusion of the 2nd NAPA project “Addressing the Risks of Climate Induced Disasters through Enhanced National and Local Capacity for Effective Actions” (2014-2019).
- Two GCF funded projects are also being implemented through the “Bhutan for Life” project for managing the network of Protected Areas as a key component of our carbon sink, and the project, “Supporting Climate Resilience and Transformational Change in the Agriculture Sector in Bhutan” addresses the adverse impacts of climate change on rural livelihood security and poverty, and the effects of sector-led development practices on the ecological integrity of biodiversity-rich forested landscapes.
- Mainstreaming climate adaptation into local development investment has been piloted since 2011 and expanded in recent years under the Local Climate Adaptive Living Facility (LoCAL) program with support from UNCDF and the EU. The first two phases of the program covered 100 “*gewogs*”⁶ under performance-based climate resilience grants with support integrated through the 11th and 12th five-year development plans. The program is planned to be scaled up to all 205 *gewogs* in the country.
- Through the Strategic Program for Climate Resilience with the World Bank, a program of climate risk management (and low carbon development) investments and activities was prepared. The priorities were fully integrated into the 12th Five Year Plan and complement NAP, NDC, and SDG priorities.
- The formulation of a National Adaptation Plan (NAP) and the establishing and strengthening of the supporting elements for the NAP process is ongoing with financing from GCF’s NAP readiness support. The project will build national capacity for long term adaptation planning, and conduct in-depth sectoral assessments for water, forest and biodiversity, health, and agriculture.

⁶ *Gewog* is a geographic administrative unit below a *dzongkhag* (district). There are 205 *gewogs* under 20 *dzongkhags* in Bhutan.

- Bhutan has started work towards preparing the Long Term Low GHG Emission and Climate Resilient Development Strategy (LTS). The LTS will provide the overall direction and guidance for Bhutan in the long-term efforts for remaining carbon neutral. The development of the LTS has been hampered by the COVID-19 pandemic and is expected to be completed in 2022.
- To facilitate the flow of financing for implementation of the NDC and adaptation priorities from the Green Climate Fund (GCF), Bhutan's Country Work Program was prepared in 2020. Direct access modalities for climate finance are also being pursued with the accreditation of the Bhutan Trust Fund for Environmental Conservation (BT FEC) as National Implementing Entity to both the GCF and the Adaptation Fund. In addition, Bhutan is pursuing access for the private sector with three financial institutions (Bhutan Development Bank Ltd, Bank of Bhutan Ltd and the Bhutan National Bank Ltd) undergoing the accreditation process for access to the Private Sector Facility of the GCF.
- Bhutan's 21st Century Economic Roadmap is being drafted as a national initiative to chart out Bhutan's long-term economic direction and to guide short and medium-term plans, programs, and policies⁷. The roadmap will articulate the main strategies in key economic priority areas for the country over the next ten years while maintaining Bhutan's effective social and environmental safeguards and integrate climate resilience and mitigation. The roadmap builds on recovery from the COVID-19 pandemic, aims to leverage "brand Bhutan" and will feed into the upcoming LTS from Bhutan and transformative green financing measures.
- The Green Finance Roadmap is being developed in line with the 21st Economic Century Roadmap and aims to mainstream and bring about transformative changes in financing economic investments and sustainable development in Bhutan for the 21st Century. The initiative aims to (i) make the financial system of Bhutan more robust and resilient to external vulnerabilities in the wake of the COVID-19 Pandemic, (ii) channel lending towards products and services that can deliver both investible returns and environmentally positive outcomes, (iii) ensure green investments are prioritised over business-as-usual investment and to mobilise additional investments in Bhutan's green sectors, (iv) accelerate the financial sector's contribution towards transitioning to a low carbon economy by leveraging on modern technology and innovations.

As outlined above, Bhutan has made concerted efforts to integrate the priorities and programs identified in the first NDC by strengthening policies, programs, and institutional arrangements for integrating climate change measures as part of our development process. Bhutan has had measured success in implementing adaptation programs due to the early start and experience from the NAPA and the LDC Work Program. With regards to mitigation action, Bhutan has been relatively successful in developing strategies and plans in key sectors but faces challenges in raising adequate support for implementation of the LEDS, NAMAs and other mitigation programs.

3. Summary of NDC (mitigation component)

In presenting the second NDC, Bhutan maintains the commitment to remain carbon-neutral where emission of greenhouse gases will not exceed carbon sequestration by our forests and sinks as first pledged in 2009 and reaffirmed in the first NDC. At the same time, Bhutan calls on the international community to continue and enhance the support for Bhutan's efforts to mitigate and adapt to climate change. Bhutan reiterates the statement in the first NDC that *"the successful implementation of our intended actions to mitigate will depend on the level of financial and technical support received"*. The actions across different priority sectors for mitigation as described in the sections below can only be realised with sufficient and adequate financial and technical support. Therefore, as Bhutan's NDC is

⁷ <https://economicroadmap.gnhc.gov.bt/>

more than our fair share of efforts for climate change mitigation, the actions describing targets, actions and strategies are conditional on receiving adequate support for implementation.

While Bhutan’s first NDC covered broad priority action areas, the second NDC further enhances our actions by elaborating priority mitigation actions in the form of LEDS, roadmaps and strategies as presented below.

a) Forest conservation and management under the National REDD+ Strategy

Bhutan has established the national REDD+ framework and produced the National REDD+ Strategy (NRS) and implementation framework including the National Forest Monitoring System, Forest Reference (Emission) Level, a Monitoring, Reporting and Verification (MRV) Mechanism, and Safeguard Information System (SIS) for REDD+⁸.

Bhutan’s NRS seeks to achieve the REDD+ objectives with a broad vision that provides co-benefits, including enhancing livelihoods, protecting ecosystem services, and biodiversity conservation. Therefore, the NRS focuses on continuing to strengthen the conservation of existing forests and increase the adaptive capacity to climate change impacts without compromising opportunities for future economic development and prosperity. To achieve this vision, there are four strategy options:

1. Strengthening Forest Management Practices
2. Climate Smart Primary Production.
3. Integrated Land Use Planning
4. Improved Rural Livelihoods.

Implementing the NRS is estimated to require approximately USD 54.5 million. Among the activities and interventions within the four strategy options, the following targets until 2030 are highlighted.

<i>Actions</i>	<i>Targets</i>
1 Improve forest management and conservation	Maintain 436 million tonnes of forest carbon stock outside protected area system
2 Maintain at least 50% of land area under protected area	Maintain 201 million tonnes of forest carbon stock in protected area 51.44% of Land area and 31% of forest area
3 Enhancement of forest carbon stock through climate smart restoration	2000 ha of plantation and restoration work
4 Initiate and promote agro-forestry (12FYP)	15 acres
5 Conservation of wetlands (SRF Land)	Conduct wetland assessment for understanding organic carbon content

As Bhutan does not have large deforestation or forest degradation, the opportunities to participate in a results-based carbon payment system to maintain the net carbon sink are limited. Therefore, the approach for the REDD+ strategy for conservation and management of the relatively large percentage of forest land area is based on the premise that protecting Bhutan’s landcover and climate proofing the economy is a strategic investment and more economical approach than the restoration challenge faced by countries that have experienced decades of deforestation. In this regard, Bhutan’s investments in forest sink management are unique and exemplary, delivering cross border benefits, and provide important lessons for other countries in effective protection and management of sustainable natural resource management.

⁸ <http://redd.dofps.gov.bt/>

b) Low Emission Development Strategy for Food security

Emissions from agriculture and livestock have not historically been increasing significantly and neither is it expected to increase significantly soon. However, emissions from this sector are a significant fraction of national emissions at 14.5%. The LEDS for Food Security covering the agriculture and livestock sector identifies six mitigation actions aimed at reducing emissions and increasing carbon sequestration⁹. The mitigation measures further elaborate on the broad measures in the INDC and identify opportunities for integration of mitigation options in sectoral actions with large potential for socio-economic development and poverty reduction. The prioritised mitigation measures and targets until 2030 listed below have cumulative mitigation potential of up to 710 Gg CO₂e.

<i>Mitigation Measures</i>	<i>Targets</i>
1 Switch from synthetic to organic fertilisers	5% annually
2 Improved agricultural practices	14,971 ha
3 Increased biomass through increased perennial crop production	17,495 ha
4 Small and medium scale domestic biogas production	10,254nos
5 Reduction of continuous rice flooding	200 ha/year
6 Improved dairy cattle production through breed improvement and feeding management	8,333 nos

The cost of implementing the above interventions will require an estimated investment of USD. 61.65 million.

c) Low Emission Development Strategy for Human Settlement

Bhutan has and is experiencing rapid urbanisation and a corresponding increase in greenhouse gases. Activities in the human settlement sector were considered across energy in buildings, transport infrastructure, waste management, land-use in urban areas, and information communication and technology. The LEDS for Human Settlement¹⁰ identifies measures over the short- and medium-term scenario (2020-2030) and include:

1. Roll out of solar PV on buildings
2. Replacement of LPG and firewood by electricity
3. Increase in composting and recycling
4. Energy efficient and green building design
5. Efficient street lighting
6. Wastewater management
7. Rollout of energy efficient appliances
8. Solar water heaters

The short and medium-term prioritized mitigation measures will lead to a cumulative mitigation potential of up to 4,122 Gg CO₂e which would require an investment of USD 101.84 Million.

d) Low Emission Development Strategy for Industries

Industries play an important part of Bhutan's economic diversification and growth. At the same time, GHG emissions from industries is projected to grow by almost a factor of three by 2035 under a business-as-usual scenario. The LEDS for Industries 2021 identifies opportunities for mitigation through technical measures, and diversification of the sector away from heavy industries to promoting

⁹ Low Emission Development Strategy for Food Security 2021, Ministry of Agriculture and Forests, Royal Government of Bhutan

¹⁰ Low Emission Development Strategy for Human Settlement 2021, Ministry of Works and Human Settlement, Royal Government of Bhutan

industries with higher value-addition and manufacturing products with cross cutting benefits in other sectors. The LEDS for Industries was prepared with full consultation and participation of the private industries of Bhutan and presents an excellent opportunity to transform the sector.

The manufacturing process related mitigation measures include:

1. Replacing fossil origin reductants with renewable charcoal
2. Cement blending

Energy efficiency measures include:

1. Waste heat recovery
2. Refuse derived fuels in cement plants
3. Energy efficiency increases in production processes
4. Direct hot charging- integrated production
5. Energy efficiency improvement of electric motor systems
6. Conversion of diesel boilers to electric boilers.

The mitigation potential from the LEDS for industries is estimated between 999 and 1,137 Gg CO₂e per annum based on the grid emission factor¹¹ or 9,990 -11,370 Gg CO₂e cumulative mitigation potential till 2030.

The LEDS for industries recommends establishment of a revolving fund mechanism, green loans, concessional financing, establishing a cleaner production centre (to be managed by the Association of Bhutanese Industries), technology transfer, and capacity building to realise the mitigation potentials.

The initial support needs for facilitating and creating an enabling environment to implement the LEDS for industry such as capacity building, detailed technical assessments and studies, policy and regulatory measures is estimated at US\$ 3.52 million dollars. This enabling activity will result in the full assessment of mitigation potentials in the industries sector and facilitate the participation of the private sector in low emission development.

e) Low Emission Development Strategy for Surface Transport

Transport emissions are projected to increase by a factor of three by 2050 as compared to 2020 levels under business-as-usual scenario. The LEDS for Surface Transport¹² was developed to provide strategic intervention options for transport and mobility and are categorised as follows:

1. Mass transit through improvements in bus systems and the introduction of open-bus rapid transit (BRT) network (electric and diesel) and light rail transit.
2. Promotion of electric passenger vehicles (taxi, two wheelers, light vehicles, buses)
3. Low emission freight transport system for heavy and commercial trucks and freight trains
4. Non-motorized transport system through public bicycle systems and improved sidewalks, crosswalks
5. Improve fuel-efficiency in internal combustion engines through stringent vehicle and emission standards
6. Private vehicle demand management through shared mobility, traffic system management carpooling, ride sharing and rental services, import restriction on internal combustion engine cars from 2030 and introducing annual import quota system.

The mitigation options with varying levels of marginal abatement costs have been prioritised for implementation with activities across the short-term (2021-2025), medium-term (until 2030) and long-term (until 2050). The mitigation measures have a cumulative mitigation potential of 5,283 Gg

¹¹ Low Emission Development Strategy for Industries 2021, Ministry of Economic Affairs, Royal Government of Bhutan.

¹² Bhutan's Low Emission Development Strategy for Surface Transport 2021, Ministry of Information and Communication, Royal Government of Bhutan.

CO₂e and are a mix of investments from relatively inexpensive low hanging interventions to large infrastructure investments up to an overall total investment requirement of USD 3,233 million till 2030. Major expenditures in the transport sector are in the areas of infrastructure development to introduce low emission transport modes.

f) Waste Management

Under the National Waste Management Strategy 2019, and the Waste Management and Stray Dog Population Control Flagship Program Bhutan has set the goal to achieve Zero Waste Bhutan whereby the current trend of disposing over 80% to the landfill is reversed to less than 20% by the year 2030 based on the principles of circular economy.

g) Sustainable Hydropower Development

Clean hydropower enables low GHG emissions from Bhutan and the achievement of carbon neutral status. Further development of hydropower projects can mitigate emissions beyond Bhutan in the region at large. Future development of hydropower will be as per the revised Sustainable Hydropower Policy 2021 and enhances climate resilience through reservoir/pumped storage schemes to ensure energy and water security. Currently, there are four hydropower projects under construction that are anticipated to be commissioned before 2030 viz. Punatsangchuu-I (1200MW), Punatsangchhu-II (1020MW), Kholongchhu (600MW) and Nikachhu (118MW) hydroelectric projects (HEP). In addition, the Sankosh HEP (2585 MW), Dorjilung HEP (1125 MW) and Nyera Amari (404MW) are priority projects that will be pursued based on evolving national circumstances.

h) Alternative Renewable Energy

An alternative renewable energy program consisting of mini hydro, solar, wind and waste-to-energy technologies will be pursued as a priority program with the aim to reduce deforestation in rural communities and diversify the energy portfolio as adaptation measure to changing water flows, particularly in the dry seasons. Medium-term targets from 2020-2028 include:

1. 71.11 MW of utility scale solar and wind energy (17.38 MW solar in Sephu, 30.73 MW solar in Shingkar and 23 MW wind in Gaselo).
2. Alternative renewable energy project to install roof mounted solar PV on 300 rural households to enable access to clean energy and displace fuelwood consumption. The regulatory policies and tariff structure for solar feed-in tariff will be prepared to encourage the growth of the prosumer market.
3. An 80-kW decentralised solar PV plant shall be developed to provide reliable and sustainable electricity supply to the Aja Ney community which is inside the Bumdeling Wildlife Sanctuary. This intervention is intended to enable access to clean energy for the communities while also curtailing their dependence on firewood.
4. More than 50 Solar Water Heating Systems (SWHS) of 1000 litres per day (LPD) capacity shall be installed in various public institutions (schools, monasteries, hospitals etc.), to curtail pressure on firewood which is otherwise deployed for heating water.
5. The remote Lunana community will be provided with a 500-kW mini-hydel to meet the energy demands of the community through a sustainable and reliable approach. This will eliminate the need for a 97km transmission line in a national protected area and avoid deforestation and degradation.
6. The feasibility of a waste to energy plant of utility scale in Thimphu will be undertaken and implemented to convert the organic waste to energy and reduce landfill emissions.

i) Green Hydrogen Roadmap

In line with the Sustainable Hydropower Policy 2021, the potential for the use of hydrogen created from green renewable electricity in Bhutan will be pursued. Towards this end a study has been initiated with the objective of exploring production of hydrogen fuel, green ammonia, and other hydrogen products for the end-uses of energy storage and substitute for fossil fuel usage. The Royal Government will initiate feasibility studies, preparation of the Green Hydrogen Roadmap and pilot projects.

j) National Energy Efficiency & Conservation Policy 2019 and Energy Efficiency Roadmap 2019

The National Energy Efficiency & Conservation Policy and the Energy Efficiency Roadmap (NEECP) were adopted in 2019. The roadmap establishes the impact of energy efficiency (EE) on the country's GHG emission in line with the first NDC targets with about 0.59 million tCO₂e emission reduction potential from implementation of EE&C measures.

The action plan aims to contribute towards the NDC mitigation measures by enhancing demand side management through (i) promotion of EE in appliances, (ii) buildings and (iii) industrial processes and technologies. The NEECP 2019 will strive to realise the energy saving potential of 155 GWh annually using energy efficient equipment, appliances and construction materials in the building, appliance and industry sector and annual fuel cost saving of Nu.467 million with implementation of various EE measures in the transport sector. Several of the actions and measures in the EE policy and action plan are also being integrated into the different LEDS for human settlements, transport, and Industries.

k) Cooperative mechanisms to achieve sustainable development and mitigation ambitions

Bhutan has participated in the Clean Development Mechanism of the Kyoto Protocol and continues to believe in the important role of innovative financing mechanisms for climate actions with sustainable development benefits. Bhutan views cooperative approaches in market and non-market mechanisms under Article 6 of the Paris Agreement as an important instrument to raise mitigation ambition with environmental integrity while promoting sustainable development and welcomes the opportunity to participate in cooperative approaches.

4. Adaptation Component

Adapting to the adverse impacts of climate change is an equally important, if not more challenging issue than mitigation for Bhutan as a nation. Bhutan included an adaptation component in the first NDC and highlighted ten broad areas of priority adaptation needs. Since then, Bhutan has started the process to formulate its National Adaptation Plan (NAP) as part of the NAP readiness support. The NAP support program will result in the preparation of Bhutan's first NAP and put in place essential elements to support the medium to long term process for adaptation planning and implementation by enhancing institutional coordination, management of climate change data and information, and capacity building of key institutions including academia, civil society, and the private sector.

Bhutan's first NAP is expected to be completed and submitted in 2021 and will be the basis of Bhutan's Adaptation Communication to convey our priorities, plans, actions, and support needs for adaptation. The NAP will cover priority needs and actions in the areas of water, agriculture, forests & biodiversity, and health.

5. Means of Implementation

While the costs for the implementation for a few of the mitigation measures have been estimated, further detailed feasibility assessments and cost benefit assessments will need to be undertaken for most of the LEDS priorities in the near future.

The implementation of the NDC will be guided by the Climate Change Policy of 2020, which describes the implementation procedures as well as the process for monitoring and evaluation. The policy describes climate change as a cross-cutting issue that needs to be addressed comprehensively and coordinated effectively across all relevant sectors and stakeholders at different levels and defines procedures and institutional roles and responsibilities for implementation. This approach includes integration of climate change priorities into the five-year plans, policies and programs while ensuring synergies.

Support for implementation will include domestic fiscal incentives and measures, policy, and regulatory measures to create an enabling environment for implementation measures in targeted sectors based on the LEDS. The domestic institutional measures to enable financial flows for climate action include the establishment of national implementing entities for direct access to the GCF and the Adaptation Fund and the private sector facility of the GCF. The green finance roadmap will enable transformative investments in carbon neutral and climate resilient development. The establishment of Bhutan Climate Fund (BCF) which is underway will serve as a sustainable financing source for Bhutan's development and conservation efforts and correspondingly contribute to diversifying the economy through the development of low-carbon infrastructures. The BCF will aggregate and monetise emission offsets (mitigation outcomes) from renewable projects in Bhutan, starting with the hydro sector.

As Bhutan is a land locked LDC with limited financial resources, international financing will be needed to implement the actions in the NDC over the next 10 years. Most of the mitigation actions in this NDC and the strategies across sectors can be realised only with adequate financing and will therefore be contingent on the level of financial support received.

6. Information to facilitate clarity, transparency and understanding of Bhutan's NDC

Further details on the mitigation component of Bhutan's second NDC are provided in the information to facilitate clarity, transparency and understanding of Bhutan's NDC as presented in Annex I.

Annex I.

Information to facilitate clarity, transparency and understanding of Bhutan's NDC¹³.

1. Quantifiable information on the reference point (including, as appropriate, a base year)													
a Reference year(s), base year(s), reference period(s) or other starting point(s);	<p>Bhutan is already carbon neutral and has achieved the goal for net zero emissions by 2050. Bhutan's commitment is to remain carbon neutral, and this refers to total emissions relative to total removals at a national level.</p> <p>Bhutan's INDC referenced the period 2000-2013 as a basis for the carbon neutral status in line with the 2nd National GHG Inventory and the 2nd National Communication. The 2nd NDC uses 2015 as base year in line with the 3rd National GHG Inventory. Bhutan's forest reference emission level (FREL) and forest reference level (FRL) submitted and assessed in 2020 utilises historical reference period of 2005-2014. However, the methodology used for the development of the FREL and FRL is consistent with the National GHG Inventory.</p>												
b Quantifiable information on the reference indicators, their values in the reference year(s), base year(s), reference period(s) or other starting point(s), and, as applicable, in the target year;	<p>Based on the Third National GHG Inventory for Bhutan¹⁴ total GHG emissions in Bhutan in 2015 was 3,814.09 Gg CO₂ equivalent (CO₂e) excluding removals by forest. The carbon sequestration capacity of Bhutan in 2015 was 9,386.59 Gg CO₂e. This results in Bhutan already achieving and exceeding the carbon neutral goal of the Paris Agreement with net GHG emissions in 2015 of -5,572.50 Gg CO₂e</p> <p>Sectoral targets and actions for low emission development are described in section 1c below.</p>												
c For strategies, plans and actions referred to in Article 4, paragraph 6, of the Paris Agreement, or polices and measures as components of nationally determined contributions where paragraph 1(b) above is not applicable, Parties to provide other relevant information;	<p>a) Forest conservation and management</p> <p>Under the National REDD+ Strategy (NRS), Bhutan will continue to strengthen the conservation of existing forests and increase the adaptive capacity to climate change impacts without compromising opportunities for future economic development and prosperity. This vision will be pursued through four strategy options:</p> <ol style="list-style-type: none"> 1. Strengthening Forest Management Practices 2. Climate Smart Primary Production. 3. Integrated Land Use Planning 4. Improved Rural Livelihoods. <p>Implementing the NRS is estimated to require approximately USD 54.5 million. Quantifiable actions and targets until 2030 include</p> <table border="1" data-bbox="619 1496 1465 1910"> <thead> <tr> <th>Actions</th> <th>Targets</th> </tr> </thead> <tbody> <tr> <td>1 Improve forest management and conservation</td> <td>Maintain 436 million tonnes of forest carbon stock outside protected area system</td> </tr> <tr> <td>2 Maintain at least 50% of land area under protected area</td> <td>Maintain 201 million tonnes of forest carbon stock in protected area 51.44% of Land area and 31% of forest area</td> </tr> <tr> <td>3 Enhancement of forest carbon stock through climate smart restoration</td> <td>2000 ha of plantation and restoration work</td> </tr> <tr> <td>4 Initiate and promote agro-forestry (12FYP)</td> <td>15 acres</td> </tr> <tr> <td>5 Conservation of wetlands (SRF Land)</td> <td>Conduct wetland assessment for understanding organic carbon content</td> </tr> </tbody> </table>	Actions	Targets	1 Improve forest management and conservation	Maintain 436 million tonnes of forest carbon stock outside protected area system	2 Maintain at least 50% of land area under protected area	Maintain 201 million tonnes of forest carbon stock in protected area 51.44% of Land area and 31% of forest area	3 Enhancement of forest carbon stock through climate smart restoration	2000 ha of plantation and restoration work	4 Initiate and promote agro-forestry (12FYP)	15 acres	5 Conservation of wetlands (SRF Land)	Conduct wetland assessment for understanding organic carbon content
Actions	Targets												
1 Improve forest management and conservation	Maintain 436 million tonnes of forest carbon stock outside protected area system												
2 Maintain at least 50% of land area under protected area	Maintain 201 million tonnes of forest carbon stock in protected area 51.44% of Land area and 31% of forest area												
3 Enhancement of forest carbon stock through climate smart restoration	2000 ha of plantation and restoration work												
4 Initiate and promote agro-forestry (12FYP)	15 acres												
5 Conservation of wetlands (SRF Land)	Conduct wetland assessment for understanding organic carbon content												

¹³ Based on Guidance provided by CMA 1

¹⁴ 3rd National GHG Inventory of Bhutan as contained in the 3rd National Communication from Bhutan to the UNFCCC, National Environment Commission 2020

b) Low Emission Development Strategy for Food security

The Low Emission Development Strategy (LEDS) for Food Security 2021 covering the agriculture and livestock sector identifies six mitigation actions aimed at reducing emissions and increasing carbon sequestration¹⁵. The mitigation measures further elaborate on the broad measures in the INDC and identify opportunities for integration of mitigation options in sectoral actions with large potential for socio-economic development and poverty reduction. The prioritised mitigation measures and targets until 2030 listed below have cumulative mitigation potential of up to 710 Gg CO₂e. The cost of implementing the interventions will require an estimated investment of USD. 61.65 million

	<i>Mitigation Measures</i>	<i>Targets</i>
1	Switch from synthetic to organic fertilisers	5% annually
2	Improved agricultural practices	14,971 ha
3	Increased biomass through increased perennial crop production	17,495 ha
4	Small and medium scale domestic biogas production	10,254 nos
5	Reduction of continuous rice flooding	200 ha/year
6	Improved dairy cattle production through breed improvement and feeding management	8,333 nos

c) Low Emission Development Strategy for Human Settlement

Bhutan has and is experiencing rapid urbanisation and a corresponding increase in greenhouse gases. Activities in the human settlement sector was considered across energy in buildings, transport infrastructure, waste management, land-use in urban areas, and information communication and technology. The LEDS for Human Settlement 2021¹⁶ identifies measures over the short- and medium-term scenario (2020-2030) and include:

1. Roll out of solar PV on buildings
2. Replacement of LPG and firewood by electricity
3. Increase in composting and recycling
4. Energy efficient and green building design
5. Efficient street lighting
6. Wastewater management
7. Rollout of energy efficient appliances
8. Solar water heaters

The short-term prioritized mitigation measures in human settlements will lead to a cumulative mitigation potential of up to 4,122 Gg CO₂e which would require an investment of USD 101.84 million.

d) Low Emission Development Strategy for Industries

The LEDS for Industries 2021¹⁷ identifies opportunities for mitigation through technical measures, and diversification of the sector away from heavy industries to promoting industries with higher value-addition and manufacturing products with cross cutting benefits in other sectors. The LEDS for Industry was prepared with full consultation and participation of the private industries of Bhutan and presents an excellent opportunity to transform the sector. The mitigation measures include:

¹⁵ Low Emission Development Strategy for Food Security 2021, Ministry of Agriculture and Forests, Royal Government of Bhutan

¹⁶ Low Emission Development Strategy for Human Settlement 2021, Ministry of Agriculture and Forests, Royal Government of Bhutan

¹⁷ Low Emission Development Strategy for Industries 2021, Ministry of Economic Affairs, Royal Government of Bhutan.

1. Replacing fossil origin reductants with renewable charcoal
2. Cement blending
3. Energy efficiency measures include:
4. Waste heat recovery
5. Refuse derived fuels in cement plants
6. Energy efficiency increases in production processes
7. Direct hot charging- integrated production
8. Energy efficiency improvement of electric motor systems
9. Conversion of diesel boilers to electric boilers.

The total mitigation potential from the LEDS for industries is estimated between 999 Gg CO₂e and 1,137 Gg CO₂e per annum depending on the grid emission factor or a cumulative mitigation potential of 9,990 – 11,370 Gg CO₂e till 2030.

The LEDS for Industries recommends establishment of a revolving fund mechanisms, green loans, concessional financing, establishing a cleaner production centre (to be managed by the Association of Bhutanese Industries), technology transfer and capacity building to realise the mitigation potentials. The initial support needs for facilitating and creating an enabling environment to implement the LEDS for industry such as capacity building, detailed technical assessments and studies, policy and regulatory measures is estimated at US\$ 3.52 million dollars. This enabling activity will result in the full assessment of mitigation potentials in the industries sector and facilitate the participation of the private sector in low emission development.

e) Low Emission Development Strategy for Surface Transport

The LEDS for Surface Transport¹⁸ was developed to provide strategic intervention options for transport and mobility and are categorised as follows:

1. Mass transit through improvements in bus systems and the introduction of open-bus rapid transit (BRT) network (electric and diesel) and light rail transit.
2. Promotion of electric passenger vehicles (taxi, two wheelers, light vehicles, buses)
3. Low emission freight transport system for heavy and commercial trucks and freight trains
4. Non-motorized transport system through public bicycle systems and improved sidewalks, crosswalks
5. Improve fuel-efficiency in internal combustion engines through stringent vehicle and emission standards
6. Private vehicle demand management through shared mobility, traffic system management carpooling, ride sharing and rental services, import restriction on internal combustion engine cars from 2030 and introducing annual import quota system.

The mitigation options with varying levels of marginal abatement costs have been prioritised for implementation with activities across the short-term (2021-2025), medium-term (until 2030) and long-term (until 2050). The mitigation measures have a cumulative mitigation potential of 5,283 Gg CO₂e and are a mix of investments from relatively inexpensive low hanging interventions to large infrastructure investments up to an overall total investment requirement of USD 3,233 million till 2030. Major expenditures in the transport sector are in the areas of infrastructure development to introduce low emission transport modes.

¹⁸ Bhutan's Low Emission Development Strategy for Surface Transport 2021, Ministry of Information and Communication, Royal Government of Bhutan.

f) Waste Management

Under the National Waste Management Strategy 2019, and the Waste Management and Stray Dog Population Control Flagship Program Bhutan has set the goal to achieve Zero Waste Bhutan whereby the current trend of disposing over 80% to the landfill is reversed to less than 20% by the year 2030 based on the principles of circular economy.

g) Sustainable Hydropower Development

Clean hydropower enables low GHG emissions from Bhutan and the achievement of carbon neutral status. Further development of hydropower projects can mitigate emissions beyond Bhutan in the region at large. Future development of hydropower will be as per the revised Sustainable Hydropower Policy 2021 and enhance climate resilience through reservoir/pumped storage schemes to ensure energy and water security. Currently, there are four hydropower projects under construction that are anticipated to be commissioned before 2030 viz. Punatsangchuu-I (1200MW), Punatsangchuu-II (1020MW), Kholongchhu (600MW) and Nikachhu (118MW) hydroelectric projects (HEP). In addition, the Sankosh HEP (2585 MW), Dorjilung HEP (1125 MW) and Nyera Amari (404MW) are priority projects that will be pursued based on evolving national circumstances.

h) Alternative Renewable Energy

An alternative renewable energy program consisting of mini hydro, solar, wind and waste-to-energy technologies will be pursued as a priority program with the aim to reduce deforestation in rural communities and diversify the energy portfolio as adaptation measure to changing water flows, particularly in the dry seasons. Medium-term targets from 2020-2028 include:

1. 71.11 MW of utility scale solar and wind energy (17.38 MW solar in Sephu, 30.73 MW solar in Shingkhar and 23 MW wind in Gaselo).
2. Alternative renewable energy project to install roof mounted solar PV on 300 rural households to enable access to clean energy and displace fuelwood consumption. The regulatory policies and tariff structure for solar feed-in tariff will be prepared to encourage the growth of the prosumer market.
3. An 80-kW decentralised solar PV plant shall be developed to provide reliable and sustainable electricity supply to the Aja Ney community which is inside the Bumdeling Wildlife Sanctuary. This intervention is intended to enable access to clean energy for the communities while also curtailing their dependence on firewood.
4. More than 50 Solar Water Heating Systems (SWHS) of 1000 litres per day (LPD) capacity shall be installed in various public institutions (schools, monasteries, hospitals etc.), to curtail pressure on firewood which is otherwise deployed for heating water.
5. The remote Lunana community will be provided with a 500-kW mini-hydel to meet the energy demands of the community through a sustainable and reliable approach. This will eliminate the need for a 97km transmission line in a national protected area and avoid deforestation and degradation.
6. The feasibility of a waste to energy plant of utility scale in Thimphu will be undertaken and implemented to convert the organic waste to energy and reduce landfill emissions.

i) Green Hydrogen Roadmap

In line with the Sustainable Hydropower Policy 2021, the potential for the use of hydrogen created from green renewable electricity in Bhutan will be pursued. Towards this end a study has been initiated with the objective of

	<p>exploring production of hydrogen fuel, green ammonia, and other hydrogen products, for the end-uses of energy storage and substitute for fossil fuel usage. The Royal Government will initiate feasibility studies, preparation of the Green Hydrogen Roadmap and pilot projects.</p> <p><i>j) The National Energy Efficiency & Conservation Policy and Energy Efficiency Roadmap 2019.</i></p> <p>The National Energy Efficiency & Conservation Policy and Energy Efficiency Roadmap (NEECP) 2019 establishes the impact of energy efficiency (EE) on the country's GHG emissions in line with the first NDC targets with about 0.59 million tCO₂e emission reduction potential from implementation of EE&C measures. The action plan aims to contribute towards the NDC mitigation measures by enhancing demand side management through (i) promotion of EE in appliances, (ii) buildings and (iii) industrial processes and technologies. The NEECP 2019 will strive to realise the energy saving potential of 155GWh annually using energy efficient equipment, appliances and construction materials in the building, appliance and industry sector and annual fuel cost saving of Nu.467 million with implementation of various EE measures in the transport sector. Several of the actions and measures in the EE policy and action plan are also being integrated into the different LEDS for human settlements, transport, and Industries.</p>
<p>d Target relative to the reference indicator, expressed numerically, for example in percentage or amount of reduction;</p>	<p>Bhutan's target is to maintain the status as a carbon neutral country. This is expressed in relative terms of total GHG emissions against total removals of GHG for each relevant target year.</p> <p>To maintain this target, Bhutan has prepared sectoral Low Emission Development Strategies, the National REDD+ Strategy and Action Plan and other sectoral plans, programs, and strategies.</p> <p>The ability for Bhutan to maintain its carbon neutral status will depend on the level of international support received to implement these sectoral strategies and plans and the realisation of this commitment is conditional on the support received.</p>
<p>e Information on sources of data used in quantifying the reference point(s);</p>	<p>For the economy wide target of remaining carbon neutral, quantifiable information is based on National GHG Inventories for Bhutan as contained in the National Communications to the UNFCCC and subsequent Biennial Update Reports.</p> <p>Sources of data for forestry emissions and removals is based on the Third National GHG Inventory included in the Third National Communication 2020, Bhutan's National Forest Reference Emission Level and National Forest Reference Level submitted in 2020, The National Forest Inventory Volume 1, 2016 and National Forest Inventory Volume II 2018.</p> <p>Reference points for sectoral targets, strategies, plans, and actions are based on the following:</p> <ul style="list-style-type: none"> • <i>National Energy Efficiency & Conservation Policy 2019 and Energy Efficiency Roadmap 2019</i> • <i>Bhutan's National REDD+ Strategy & Action Plan</i> • <i>Bhutan's Low Emission Development Strategy for Food Security 2021</i> • <i>Bhutan's Low Emission Development Strategy for Human Settlement 2021</i> • <i>Bhutan's Low Emission Development Strategy for Industries 2021</i> • <i>Bhutan's Low Emission Development Strategy for Surface Transport 2021.</i>

f	<p>Information on the circumstances under which the Party may update the values of the reference indicators.</p> <p>Values may change due to improvements in the GHG inventory and Biennial Update Reports and completion of assessments leading to the development of Bhutan's Long-Term Strategy including an assessment and selection of Bhutan's Grid Emission Factor.</p>
<p>2. Time frames and/or periods for implementation:</p>	
a	<p>Time frame and/or period for implementation, including start and end date, consistent with any further relevant decision adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA);</p> <p>Bhutan's enhanced mitigation efforts to remain carbon neutral includes sectoral targets, strategies, and activities from the year 2021 to 2030 based on the references in 1(e) above.</p>
b	<p>Whether it is a single-year or multi-year target, as applicable.</p> <p>Bhutan's overall national target is to maintain the carbon neutral status. This is expressed in relative terms of total GHG emissions against total removals of GHG for each relevant target year.</p> <p>Bhutan's enhanced mitigation efforts to remain carbon neutral includes sectoral targets, strategies, and activities from the year 2021 to 2030 based on the references in 1(e) above.</p>
<p>3. Scope and coverage:</p>	
a	<p>General description of the target;</p> <p>Bhutan's target is to maintain the status as a carbon neutral country where total GHG emissions do not exceed total removals by sinks including forests.</p> <p>In order to maintain this carbon neutral status, sectoral targets, programs and plans have been prepared as part of sectoral LEDS and National REDD+ Strategy and Action Plan as described above in section 1(c).</p> <p>The implementation and achievement of this target will depend on the level of support available for implementation and is therefore conditional on support received.</p>
b	<p>Sectors, gases, categories and pools covered by the nationally determined contribution, including, as applicable, consistent with Intergovernmental Panel on Climate Change (IPCC) guidelines;</p> <p>For the overall target to remain carbon neutral, all gases and sectors are as described in the Third National Communication.</p>
c	<p>How the Party has taken into consideration paragraph 31(c) and (d) of decision 1/CP.21;</p> <p>All the methodologies and tools used for GHG inventory reporting followed the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006), Good Practice Guidance, and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000). The methodologies used was from Tier 1 using the default emission/removal factor except for forestry sector where some country specific carbon density data was used. In general, each method was applied based on the availability of data and analysis of key categories.</p> <p>The latest GHG inventory for 2015 estimated emissions sources of energy, IPPU, AFLOU, waste, and removals by sink. The three main gases, namely carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), is estimated using the 2006 IPCC Guidelines. Carbon monoxide (CO) and nitrogen oxide (NO_x) were calculated for forestry and other land use only.</p> <p>Emissions of perfluorocarbons (PFCs), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF₆) are not estimated as products containing these gases are not produced in the country.</p>

	<p>Bhutan's National Forest Reference Emission Level and National Forest Reference Level describes the methodologies for emissions and removals from forests. Consistency in approaches and definitions have been maintained with the national communications and GHG inventories.</p> <p>The collection of data and information is still a challenge when compiling the GHG inventory for Bhutan. Bhutan aspires to gradually improve its reporting by adopting higher tier methods with continued international support and as local capacity develops, and more disaggregated data becomes available.</p>
<p>d Mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans, including description of specific projects, measures and initiatives of Parties' adaptation actions and/or economic diversification plans.</p>	<p>Hydropower from run-of-river projects has been one of the main sources of revenue for Bhutan's economic development. However, climate change is threatening the generation of clean hydroelectricity, particularly in the dry season with diminishing winter precipitation and the rapidly disappearing Himalayan cryosphere. In addition, the rapid melting of the glaciers and risk of glacial lake outbursts also threaten hydropower investments.</p> <p>To address the adverse impacts of climate change, the Sustainable Hydropower Development Policy (SHDP) 2021 enhances Bhutan's hydropower policy by integrating climate resilience and mitigation. The SHDP emphasises adaptation measures such as reservoir/pumped storage schemes in addition to run-of-river schemes. Energy security and climate resilience will also be enhanced through ventures in energy storage technologies such as hydrogen fuel, green ammonia, and other emerging technologies. Other alternative renewable energy in the form of solar, wind and micro-hydro, including participation through feed-in tariff will also be further promoted for diversifying the energy mix.</p> <p>While these measures are primarily being undertaken to adapt to the increasing threats from adverse impacts of climate change to Bhutan's energy security, these adaptation measures will result in tangible mitigation benefits.</p>
<p>4. Planning processes:</p>	
<p>a Information on the planning processes that the Party undertook to prepare its nationally determined contribution and, if available, on the Party's implementation plans, including, as appropriate:</p>	<p>The COVID-19 pandemic affected the preparation of the second NDC from Bhutan with disruptions and delays to technical work and the consultation process.</p> <p>However, the preparation of the 2nd NDC builds on experience of 1st NDC which was prepared in a short timeframe utilising existing policies, plans and strategies. The 2nd NDC has been informed by deliberate preparatory steps which included awareness and capacity building of relevant stakeholders in understanding climate change mitigation and adaptation, and the obligations arising out of the UNFCCC and the Paris Agreement. Technical assessments in the form of LEDS for priority sectors were also conducted to elaborate the broad priority actions identified in the 1st NDC. These preparatory assessments towards the NDC include the intensive work undertaken under the REDD+ Readiness program including the first full National Forest Inventory and preparation of the FREL and FRL.</p> <p>Additional studies were also conducted to fill gaps in understanding gender issues as related to climate change and environment. This study was used as inputs to inform the preparation of the LEDS and recent climate policies and actions.</p> <p>Preparation of all relevant strategies and the NDC formulation was carried out in a highly consultative manner while catering to national COVID-19 protocols. Despite the disruptions and difficulties presented by the COVID-19 pandemic, in-person meetings were conducted with social distancing measures when feasible, and teleconferencing video technologies were utilised during periods of lockdowns and health protocol restrictions.</p> <p>The support and participation of government agencies, stakeholder groups including CSOs and private sector with support from the UNDP Climate Promise</p>

	<p>program was essential for the process of preparing the NDC under trying and difficult circumstances.</p>
<p>i) Domestic institutional arrangements, public participation and engagement with local communities and indigenous peoples, in a gender-responsive manner;</p>	<p>The 2nd NDC builds on the 1st NDC with the subsequent preparation the National REDD+ Strategy and Action Plan, the LEDS for sectoral actions, the National Energy Efficiency & Conservation Policy and the Energy Efficiency Roadmap 2019. All these strategies were prepared in a highly consultative manner.</p> <p>To get an understanding of gender issues in the context of climate change and related policy responses in Bhutan a study on gender and climate change in Bhutan for priority sectors of Agriculture, Energy and Waste was carried out¹⁹. The findings and recommendations helped set a basis for understanding gender and climate linkages while enabling the incorporation of gender approaches in the three sectors. It also helped to inform gender considerations in the development LEDS for agriculture, transport, and waste. Further in-depth studies for gender and climate change covering additional sectors and issues are needed.</p> <p>The second NDC from Bhutan has been prepared through an extensive process of technical assessments, and wide-ranging stakeholder consultation process. The consultation process included technical experts from government agencies, representatives of private sector, academia, civil society and youth groups, and high-level government consultation and review.</p>
<p>ii) Contextual matters, including, inter alia, as appropriate:</p>	
<p>(a) National circumstances, such as geography, climate, economy, sustainable development and poverty eradication;</p>	<p>Bhutan is a small, landlocked country with an area of 38,394 km² situated on the southern slope of the Eastern Himalayas. The country is almost entirely mountainous with altitudes ranging from about 100 meters in the foothills to over 7,500 meters in the north. Due to its fragile mountainous ecosystem, Bhutan is highly vulnerable to impacts of climate change and extreme weather events. The situation is further worsened by the country's low adaptative capacity and poor economic status constrained by limited financial, technical, and human capacity. Additionally, the country's economy is still predominantly dependent on climate sensitive sectors like agriculture (more than 60% of rural population depend for livelihood) and hydropower. The mountainous landscape makes communication and transport very fragile and expensive.</p> <p>Bhutan has a total of 70.77 % forest cover (2,717,162 ha) out of the total geographical area (3,839,400 ha) of the country. Due to the high forest cover, pristine environment, strong conservation efforts and good network of Protected Areas, Bhutan has exceptionally rich biodiversity with one of the highest species densities and flourishing populations of some of the rarest flora and fauna on earth.</p> <p>Most of the major rivers in Bhutan originate from glaciers and are recharged by watershed. Most of the river discharge results from rainfall, supplemented by an estimated 2-12% glacial melt and another 2% from snow melt. The combined outflow of the rivers is about 70,576 million m³, or 2,238 m³/s, which corresponds to a flow of 109,000 m³ per capita per year, the highest in the region.</p> <p>Bhutan is one of the least populated countries in Asia with a total population of 727,145 in 2017 and population growth rate of 1.3% per annum. Bhutan is one of the world's smallest economies, with gross domestic product (GDP) in 2017 recorded at Nu 164.6 billion or approximately USD 2.4 billion. However, growth</p>

¹⁹ Gender and Climate Change in Bhutan with a focus on Nationally Determined Contribution areas: Agriculture, Energy and Waste, National Commission for Women and Children, Royal Government of Bhutan, 2020.

	<p>has been remarkable, with the economy growing at an average rate of seven percent over the past decade, mainly due to investments in the hydropower sector. GDP per capita increased from USD 2,464 in 2013 to USD 3,438 in 2017. However, the COVID 19 pandemic has led to a shrinkage in economic activities and the Asian Development Bank has forecast Bhutan’s economic growth to contract by 3.4% this fiscal year (FY) 2021 from 0.9% in FY2020.</p> <p>Bhutan was categorized as a Least Developed Country (LDC) by the United Nations General Assembly (UNGA) in 1971. However, over the decades, Bhutan has made remarkable socio-economic advancements, qualifying the country for graduation from this category for the first time at the 2015 triennial review of the list of LDCs.</p> <p>As a least-developed country with a young growing population, Bhutan has pressing needs for economic development and poverty eradication in a challenging environment while conserving of a globally significant natural environment.</p>
<p>(b) Best practices and experience related to the preparation of the nationally determined contribution;</p>	<p>The COVID-19 pandemic affected the preparation of the second NDC from Bhutan with disruptions and delays to technical work and the consultation process.</p> <p>Learning from the experience of 1st NDC which was prepared in a short timeframe utilising existing policies, plans and strategies, the 2nd NDC has been informed by deliberate preparatory steps of capacity building of relevant stakeholders in understanding climate change mitigation and adaptation and the preparation of technical assessments in response to the 1st NDC. These steps are described in section 4a above.</p> <p>With the disruptions and difficulties presented by the COVID-19 pandemic, social distancing measures were adopted meetings when feasible and teleconferencing video technologies during periods of lockdowns and health protocol restrictions.</p> <p>The support and participation of government agencies, stakeholder groups including CSOs and private sector with support from the UNDP Climate Promise program was essential for the process of preparing the NDC under trying and difficult circumstances.</p> <p>The 2nd NDC preparation highlighted the need for continuous capacity building in understanding climate change causes, impacts and actions.</p>
<p>(c) Other contextual aspirations and priorities acknowledged when joining the Paris Agreement;</p>	<p>N.A</p>
<p>b Specific information applicable to Parties, including regional economic integration organizations and their member States, that have reached an agreement to act jointly under Article 4, paragraph 2, of the Paris Agreement, including the Parties that agreed to act jointly and the terms of the agreement, in accordance with Article 4, paragraphs 16–18, of the Paris Agreement;</p>	<p>N.A.</p>

<p>c How the Party's preparation of its nationally determined contribution has been informed by the outcomes of the global stocktake, in accordance with Article 4, paragraph 9, of the Paris Agreement;</p>	<p>N.A.</p>
<p>d Each Party with a nationally determined contribution under Article 4 of the Paris Agreement that consists of adaptation action and/or economic diversification plans resulting in mitigation co-benefits consistent with Article 4, paragraph 7, of the Paris Agreement to submit information on:</p>	
<p>i) How the economic and social consequences of response measures have been considered in developing the nationally determined contribution;</p>	<p>N.A.</p>
<p>ii) Specific projects, measures and activities to be implemented to contribute to mitigation co-benefits, including information on adaptation plans that also yield mitigation co-benefits, which may cover, but are not limited to, key sectors, such as energy, resources, water resources, coastal resources, human settlements and urban planning, agriculture and forestry; and economic diversification actions, which may cover, but are not limited to, sectors such as manufacturing and industry, energy and mining, transport and communication, construction, tourism, real estate, agriculture and fisheries.</p>	<p>See 3(d) above.</p>
<p>5. Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals:</p>	
<p>a Assumptions and methodological approaches used for accounting for anthropogenic greenhouse gas emissions and removals corresponding to the Party's nationally determined contribution, consistent with decision 1/CP.21, paragraph 31,</p>	<p>The accounting approach is from Bhutan's Third National GHG inventory which followed the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 2006), Good Practice Guidance, and Uncertainty Management in National Greenhouse Gas Inventories (IPCC, 2000). The methodologies used was from Tier 1 using the default emission/removal factor except for forestry sector where some country specific carbon density data was used. The decision trees provided in the IPCC Guidelines guided the choice of methods for inventory.</p>

<p>and accounting guidance adopted by the CMA;</p>	<p>Net emission has been presented in carbon dioxide equivalents (CO₂e) using the 100 - year global warming potentials (GWPs) from the 1995 IPCC Second Assessment Report (SAR)</p> <p>For constructing Bhutan's FREL and FRL, methodologies used were the 2006 IPCC Guidelines, 2019 IPCC Guidelines refinement and guidance from the Global Forest Observations Initiative and the Greenhouse Gas Protocol. The Green Climate Fund scorecard and guidelines from the FCPF Methodological Framework for high-forest, low-deforestation countries were also considered. Wherever possible, country specific data have been used for the construction of the FREL and FRL of Bhutan.</p>
<p>b Assumptions and methodological approaches used for <i>accounting for the implementation of policies and measures or strategies</i> in the nationally determined contribution;</p>	<p>In addition to the overall methodologies in 5a above, policies measures and strategies in the NDC were guided by 2006 IPCC guidelines and additional approaches for specific LEDS across sectors as detailed within the respective LEDS. Policies, measures, and strategies in sectors are described within the respective strategy documents:</p> <ul style="list-style-type: none"> • Forest related policies and measures are described in the National REDD+ Strategy and Action Plan 2020 • For agriculture and livestock in <i>Bhutan's Low Emission Development Strategy for Food Security 2021</i> • For Industries in, <i>Bhutan's Low Emission Development Strategy for Industries 2021 & The National Strategy and Action Plan for Low Carbon Development 2012.</i> • For human settlements including waste management, in <i>Bhutan's Low Emission Development Strategy for Human Settlement 2021</i> • For surface transport in <i>Bhutan's Low Emission Development Strategy for Surface Transport 2021</i>
<p>c If applicable, information on how the Party will take into account existing methods and guidance under the Convention to account for anthropogenic emissions and removals, in accordance with Article 4, paragraph 14, of the Paris Agreement, as appropriate;</p>	<p><i>As described in 5a above.</i></p>
<p>d IPCC methodologies and metrics used for estimating anthropogenic greenhouse gas emissions and removals;</p>	<p>2006 IPCC Guidelines and IPCC GPG as in 5a above.</p>
<p>e Sector-, category- or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, as appropriate, including, as applicable:</p>	
<p>i) Approach to addressing emissions and subsequent removals from natural disturbances on managed lands;</p>	<p>For constructing Bhutan's FREL and FRL, methodologies used were the 2006 IPCC Guidelines, 2019 IPCC Guidelines refinement and guidance from the Global Forest Observations Initiative and the Greenhouse Gas Protocol. The Green Climate Fund scorecard and guidelines from the FCPF Methodological Framework for high-forest, low-deforestation countries were also considered.</p>

	See “Bhutan’s Proposed National Forest Reference Emission Level and National Forest Reference Level 2020” ²⁰
ii) Approach used to account for emissions and removals from harvested wood products;	For the National Forest Reference Emission Level and Forest Reference Level, harvested wood products were counted as part of emissions and was not considered as removals due to lack of capacity, data, and technology to segregate emissions and removals in this sub-category. This could be considered in the future as part of the future FREL and FRL improvement program (if technical and financial support are available).
iii) Approach used to address the effects of age-class structure in forests;	For the National Forest Reference Emission Level and Forest Reference Level development, age class forest structure specifically was not segregated, however, average values were used covering all different age class and elevation, so the figures are representative of the forests of Bhutan. The IPCC’s recommended 20 years transition period was also used across all REDD+ activities. If there is available support technically and financially, age class wise segregation and their emissions and removal could be considered for further improvement of the FREL and FRL.
f Other assumptions and methodological approaches used for understanding the nationally determined contribution and, if applicable, estimating corresponding emissions and removals, including:	
i) How the reference indicators, baseline(s) and/or reference level(s), including, where applicable, <i>sector-, category- or activity-specific reference levels</i> , are constructed, including, for example, key parameters, assumptions, definitions, methodologies, data sources and models used;	As in 5a and 5b above.
ii) For Parties with nationally determined contributions that contain non-greenhouse-gas components, information on assumptions and methodological approaches used in relation to those components, as applicable;	As in 5b above.
iii) For climate forcers included in nationally determined contributions not covered by IPCC guidelines, information on how the climate forcers are estimated;	N.A.

²⁰ <https://redd.unfccc.int/submissions.html?country=btn>

iv) Further technical information, as necessary.	N.A.
g The intention to use voluntary cooperation under Article 6 of the Paris Agreement, if applicable.	Bhutan has participated in the Clean Development Mechanism of the Kyoto Protocol and continues to believe in the important role of innovative financing mechanism for climate actions with sustainable development benefits. Bhutan views cooperative approaches in market and non-market mechanisms under Article 6 of the Paris Agreement as an important instrument to raise mitigation ambition with environmental integrity while promoting sustainable development and welcomes the opportunity to participate on cooperative approaches.
6. How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances:	
a How the Party considers that its nationally determined contribution is fair and ambitious in the light of its national circumstances;	<p>Bhutan is already carbon neutral and commits to maintain this status despite national circumstances as a landlocked least developed country, with very high vulnerability in a fragile mountainous ecosystem.</p> <p>Considering the challenging national circumstances and with pressing needs for poverty reduction and sustainable development, Bhutan's NDC is the highest possible ambition and more than its fair share of action and burden.</p>
b Fairness considerations, including reflecting on equity;	<p>Bhutan is a landlocked LDC with a small economy and limited resources. In addition, considering the historical and current emissions from Bhutan and our imperatives for sustainable development, Bhutan's NDC is most ambitious and more than our fair share of efforts to combat climate change.</p> <p>Bhutan also finds itself in a unique situation of not being able to participate in results-based financing after maintaining impressive forest sinks that provide climate, biodiversity and riverine services and benefits beyond our borders. It is also difficult to mobilise support for implementing our LEDS and NAMAs due to low historical emissions.</p> <p>The commitment to remain carbon neutral is an economy wide target that can limit the aspirations and vision of Bhutan for a peaceful and prosperous society. In this regard, financial and technical support from the international community is essential to implement the NDC and therefore the conditional requirement for implementation of the measures.</p>
c How the Party has addressed Article 4, paragraph 3, of the Paris Agreement;	<p>Bhutan is already carbon neutral and re-affirms this pledge to maintain this status.</p> <p>The 2nd NDC contains enhanced actions as compared to the 1st NDC:</p> <ul style="list-style-type: none"> - Whereas the 1st NDC contained broad priority areas for both mitigation and adaptation action, the 2nd NDC presents specific sectoral mitigation actions with both GHG and non GHG target aligned with sectoral strategies and priority plans in the form of Low Emission Development Strategies. - The data for the NDC has been greatly enhanced with the 3rd GHG Inventory, the completion of the National Forest Inventory, and submission of Bhutan's National Forest Reference Emission Level and National Forest Reference Level. <p>Bhutan has also consistently taken measures to implement the 1st NDC and elaborate on actions and prepare strategies in preparation for the 2nd NDC as reported in section 2 "<i>Progress on implementing climate action since the INDC and ratification of the Paris Agreement</i>" presented in the main text.</p>
d How the Party has addressed Article 4, paragraph 4, of the Paris Agreement;	Bhutan's commitment to remain carbon neutral is effectively an economy wide target where total national GHG emissions will be kept below forest sink capacity. Bhutan's 2 nd NDC elaborates the mitigation action in key sectors in the

	form of LEDS, action plans, and priority needs to meet the objective of remaining carbon neutral while pursuing our sustainable development goals.
e How the Party has addressed Article 4, paragraph 6, of the Paris Agreement.	Bhutan’s carbon neutral commitment is effectively an economy wide target. A suite of strategies and plans have been prepared for sectoral actions to fulfil targets as described in section 1 above.
7. How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2:	
a How the nationally determined contribution contributes towards achieving the objective of the Convention as set out in its Article 2;	While Bhutan’s absolute emissions are negligible at a global level and historical emissions are very low, Bhutan’s NDC contributes to the ultimate objective of the Convention by having already met the 2050 goal of achieving net carbon neutrality. The NDC identifies our priority measures, actions, and needs to maintain this carbon neutral status.
b How the nationally determined contribution contributes towards Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement.	<p>Bhutan has already achieved the “balance between anthropogenic emissions by sources and removals by sinks”. In fact, Bhutan’s emissions are net negative - 5,572.50 Gg CO2e) as elaborated in sections 1, 3 & 5 above.</p> <p>Bhutan intends to contribute to the ultimate objective of the Convention by maintaining its carbon neutral status.</p> <p>Bhutan’s NDC elaborates measures to ensuring that growth in pursuit of sustainable development and poverty eradication is achieved by low emission development pathways to maintain its carbon neutral status.</p>
