Funded by the European Union

Project implemented by DAI
Shaping a more livable world.

Study on Business Development Opportunities for Green and Climate-Smart Technologies in Bhutan

November 2021

Disclaimer

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of DAI (the Contractor) and do not necessarily reflect the views of the European Union.

Acknowledgements

Thanks to the Royal Government of Bhutan (RGoB) and DAI, particularly Karma Tshering, Chief Planning Officer and Tashi Yangzom (EU-TACS Focal Point), Deputy Chief Planning Officer, Policy and Planning Division, Ministry of Agriculture and Forests, including Sonam Tashi (EU TACS Focal Point), Senior Program Officer, Department of Local Governance for providing all field coordination and assistance in making the consultations possible with various agencies and stakeholders. Their inputs were highly solicited to provide guidance and oversee the reports.

It was of immense help during the whole assignment process from the EU-TACS counterparts who provided valuable feedback and constant advice starting from the inception report and towards the finalization of the Report.

Special thanks goes to Gaki Wangmo (Development Cooperation Division at GNHC), Pattabiraman Subramanian (Senior Programme Manager at Delegation of the European Union to India and Bhutan) for their continuing and patient support and cooperation in the project.

Authors of the report: NORLHA Engineering and Management Consultancy

Edits and revisions from DAI: David Billing – RNR sector Expert/ Key Expert 1, Gustavo Porres Izquierdo – Project Manager

Pictures

Cover © Shutterstock
p. 15, 27 © Unsplash

Table of contents

Executive summary 6

1. Introduction 8

1.1 Background 8
1.2 Scope of the study 9
1.3 Methodology 9
1.4 Sample 10
1.4 Field consultations 11
1.4 Study Limitations 12

2. Analysis of business opportunities 13

2.1 Green Business Technologies Context Assessment 13
2.2 Potential Green Business Models 13
2.3 Selection and ranking of Green Businesses Technologies 15
2.4 Climate-Smart Technologies Contextual Assessment 16
2.5 Potential Climate-Smart Technologies 17
2.6 Selection and ranking of Climate-Smart Technologies 18

3. Findings and challenges in business development 19

3.1 Capacity, Institutional and Policy Gaps 19
3.2 Business Planning and Management Issues 21
3.3 Raw Materials, Waste and Recycling Issues 23
3.4 Demand for Climate-Smart Technologies 23
3.4 Private Business Stakeholder Issues 24

4. Recommendations 25

4.1 Development of plans and frameworks 25
4.2 Start-up process 26
4.3 Areas for investments and up-scaling 27
4.4 Capacity-building 29
4.5 Create Awareness 29
4.6 Action Plan 30

List of abbreviations/acronyms

DHMS	Department of Hydrological and Meteorological Services
DOA	Department of Agriculture
FAO	Food and Agriculture Organization
GDP	Gross Domestic Production
GNHCS	Gross National Happiness Commission Secretariat
JICA	Japan International Cooperation Agency
KPI	Key Performance Indicators
M&E	Monitoring and Evaluation
MCM	Million Cubic Meters
MIS	Management Information System
Mt	Metric Ton
NECS	National Environment Commission Secretariat
NIMP	National Irrigation Master Plan
RGB	Royal Government of Bhutan
RNR	Renewal Natural Resources
SCF	Synthetic Chemical Fertilizer
SPS	Safeguard Policy Statement
TNA	Training Need Assessment
TOR	Terms of Reference
WUA	Water Users Association

Glossary

Chhuzhing	Levelled bunded terrace, also known as wet land
Dzongkhag(s)	Administrative unit - District
Dzongkhag Tshogdu	District Development Committee
Gewog(s)	Administrative unit - Block
Gewog Tshogde	Decision making body in the Gewog
Kamzhing	Sloping unbunded terrace (dry land)
Khimsa	Homestead (residential land)
Nu	Ngultrum (Bhutanese currency)
RPBC	Regional Pig Breeding Centre (Yusipang

Units of measurement and conversion

Acre	Measure of land areas
One acre	0.404686 ha
One ha	2.47105 acres

Executive summary

According to the Constitution, Bhutan's forest cover stands at 71%. Bhutan has committed in international forums to remaining carbon neutral. The 'Bhutan for Life' Fund was established during the 11th plan period for sustainable funding of environmental conservation initiatives. A total of US$43 million was committed under the Fund. The Fund was carried over into the 12th Plan Period.

Green activities in the 10th and 11th plans have focused on planting trees, conservation, and increasing environment aesthetics, with little emphasis on the broader environmental issues in Bhutan, such as waste management, recycling, and climate mitigation and adaptation.

Several comprehensive green initiatives have been introduced during the 11th and 12th plan periods. Free electricity up to 100 units was provided to rural households to reduce the use of firewood. Public transport has introduced additional buses, purchase of electric cars was promoted. Initiatives have replaced incandescent bulbs used at home and in street lighting. Tax incentives were provided on environment-friendly construction materials, waste management types of machinery, and other modern environment-friendly technologies.

However, growth and development need to increase pressure on the environment through growth in demand for resources, pollution, and congestion. Waste management has emerged as a significant issue, which may impede the integration of environmental concerns and green approaches into development investments and plans.

This study aims to supply a comprehensive set of information in the format of Volume 2: Green Business Models (GBMs) and Volume 3 focused on Climate-Smart Technologies (CSTs). These two volumes are integrated with the findings of a separate assessment of Circular Economy models with the RNR sector (EU-TACs A2.12), including waste management and economical use of bi-products. The conclusions derived from each of these two studies, remain with each set of proposals that are located in their respective Report.

Volume 3 of this study provides an extensive list of potential Climate-Smart Technologies that were then short-listed to prepare a set of technology models at a pre-feasibility level. These CST models are intended to demonstrate and create an awareness of the range and depth of Climate-Smart methods, primarily directed at farmers, especially female agri-producers, that are available to potential entrepreneurs.

Volume 2 of this study provides a thorough list of potential green businesses and the support services they may require, which were then short-listed to prepare a set of business models at a pre-feasibility level.

To avoid duplication, the **present document Volume 1 holds a single Action Plan** that details the actions derived both from the *Study on Business Development Opportunities for Green and Climate-Smart Technologies in Bhutan* (EU-TACS A2.7) and, as well, the actions that are proposed in the *Study on the Application of the Circular Economy and Waste Recycling to Bhutan's RNR sector* (EU-TACS A2.12).

The present research, ***"Study on Opportunities for Green and Climate Smart Technologies Employment and Business Development in Bhutan"*** (the "Study" composed of Volumes 1,2 and 3) was requested by the Department for Local Government (DLG) to assist them with developing a green business promotion agenda, for the private sector in the 20 Dzongkhags of Bhutan. Due to the technical nature of the study, DLG requested the Ministry of Agriculture and Forests (MoAF) to carry out this study on their behalf, and this was agreed by the Policy and Planning Division (PPD) at MoAF. A consulting firm was hired to carry out the study supported by a Focal Point at PPD, MoAF, and the Senior Key Expert for the RNR Sector under the EU-TACS Project.

The main aims of the study, supported by the EU-TACS Project (as Activity A2.7), were to identify green business and climate-smart opportunities that had already been successfully piloted and demonstrated or even up-scaled throughout Bhutan. The initial problem was to define a green business taxonomy. The focus was then narrowed to the circular economy, rural waste management, and climate-smart technologies for

both the renewable natural resources sector, and to a lesser extent, the overall rural development sector. These are **central to promoting small and medium scale business enterprises within the private sector and generating employment opportunities for educated and unemployed rural youth.**

This study was conducted through surveys, consultation workshops, and bilateral interviews with relevant agencies. Six types of survey questionnaires collected information from farmers, businesses, and officials across eight Dzongkhags.

The collected information was then used in conjunction with literature and policy document reviews to identify an extensive list of Green Business and Climate Smart Technologies that can be adopted in Bhutan to address the primary needs of the study. These Green Businesses and Climate Smart Technologies are then put through a multi-criteria analysis to short-list the most suitable businesses and technologies.

Note that *Green Business companies tend to produce products for sale. In contrast*, *Climate Smart Technology businesses are aimed more at the individual farm-level*, to provide services through innovative technologies to combat the impacts of climate change on the climate-sensitive features of Bhutan's farming systems.

Seven **Green Businesses Models** (GBM) were selected to prepare business plans with cost-benefit analyses. Based on the short-listing assessment, it has been found that for green business the most promising, viable, and economic projects which provide green products for the market are: (i) biodegradable plates and cups from areca nut leaves, (ii) bitumen from plastic waste for rural road surfacing, (iii) fuel briquettes from sawdust and other suitable waste biomass, (iv) pencil-making from waste paper, (v) packing materials (shopping bags with various designs) from waste paper and cardboard, (vi) organic biofertilizer from organic waste material, and (vii) mushroom cultivation using waste woody materials.

In the case of **Climate-Smart Technologies** (CST), where businesses can provide services to farmers and rural entrepreneurs such as equipment and machinery supply, the turn-key establishment of technologies, maintenance of technologies, and training or skills transfer to farmers/rural entrepreneurs, the following were selected as the six most economically viable and providing immediate benefits to farmers, unemployed youth and entrepreneurs: (i) hydroponics for vegetable production, (ii) rainwater harvesting from rural and farm infrastructure, (iii) solar fencing for farmland to reduce human-wildlife conflict, (iv) solar cookers for nomadic herders, (v) water pumps for irrigation delivery systems; and (vi) cold storage technologies to preserve harvested crops and to extend marketing seasons.

The primary follow-up from the A2.7 study was a **training and awareness course** managed through DLG targeting unemployed rural youth, women's groups, Dzongkhag planners, private sector businesses, State-Owned Enterprises, and cooperatives. The findings of the Overall Study Volume 1 and the detailed information held in Volume 2 and Volume 3, would be used to develop training materials for further training events to be held in 2022, and then onwards in time.

During follow-up training courses, these proposed business models would demonstrate and create an awareness of the range and depth of green businesses and CSTs available to potential entrepreneurs. The green business and climate-smart technologies models that are viewed as attractive to potential entrepreneurs, should be the subject of further support to prepare location-specific feasibility studies, SME business plans, and build support amongst likely interested entrepreneurs.

As mentioned, the MoAF has been supported by EU-TACS to generate a macro-level study (EU-TACS activity A2.12) on defining circular economic models for all RNR sectors. This A2.12 study was completed in February 2022 and focused on waste management aspects of the three RNR sub-sectors, emphasizing defining models, integrating efforts, and strategic programming. **A separate Action Plan is held in the report of A2.12 that responds to the national-level scope of the expected outcomes of study A2.12**, that proposes actions by the MoAF, DoL, DoA, MoEA, DLG and Dzongkhag administrations.

1. Introduction

1.1. Background

Bhutan is a small country nestled in the Himalayas, where the Renewable Natural Resources (RNR) sector plays a vital role in enhancing food and nutrition security and improving rural livelihoods while also sustaining the management and utilization of natural resources.

In 2017 the primary RNR sector still absorbed 54% of the workforce and contributed almost 18% to Bhutan's GDP. The agriculture sub-sector contributed 11% against the contributions of the livestock and forestry sub-sectors at 4.4% and 2.4%, respectively.

As per the 2017 population and housing census, 735,553 persons live in Bhutan, out of which 62% live in rural areas, 19% live in the capital Thimphu, and 19% live in Dzongkhags centers and other urban areas[1].

There are also 27,000 licensed businesses across Bhutan, many of whom produce bi-products or waste in some form or other and are impacted upon by climate change pressures to varying degrees. The rapid urbanization and commercialization of Bhutan's agriculture, livestock and forestry sectors have resulted in more waste and more significant volumes of recyclable by-products.

Of the total national estimate of waste generated of 172 metric tons per day, approximately 50% comprises food waste; it includes all the waste generated from kitchens such as vegetables, fruits, food remains, etc. Plastics in the form of soft plastics for bags, polyethylene terephthalate (PET) water bottles, and high-density polyethylene (HDPE) used for milk, detergent, and bleach bottles is the second most common waste with 17% by weight, followed by paper and cardboard (16%).

In urban households, food waste constitutes almost 60% of the total waste, while in rural households, the proportion of food waste is comparably lower at 40%[2].

The Department of Local Government (DLG) has recognized the need to control waste in urban and rural areas. The DLG plans to include waste management and recycling into the Local Economic Development plans of each Dzongkhag and support service delivery of climate-smart technologies through the private sector. The EU-TACS Project is supporting this during the calendar year 2021.

Based on the Vision 2040 strategy, the Ministry of Agriculture and Forest highlighted the need for:

(1) *the development of 'circular economy models' within the RNR sector in the areas of agriculture, livestock and forestry;*
(2) *'Waste recycling' and economical use of bi-products from existing RNR enterprises, and*
(3) *Support the provision of innovative and green employment opportunities.*

To meet these objectives, a study was proposed to be led by the Ministry of Agriculture and Forests (MoAF) on **'Opportunities for Green and Climate Smart Technologies Employment and Business Development in Bhutan'** that is to be followed by training courses (by DLG) on Green Business and CST Service Delivery Opportunities. The target groups are Rural Youth, Women's Groups, Business Entrepreneurs, and Dzongkhag planners, to address some of these green investment areas.

[1] NSB (2017) Population and Housing Census for 2017.
[2] National Waste Management Strategy 2019, NEC.

1.2. Scope of the study

The scope of this study is divided into two parts, one focusing on green business development and the other on climate-smart technology business development. The objectives of each Volume were to:

Volume 1: Green Business Development

(i) Survey a sample of SME and large businesses to assess how far they follow green business principles in their business models and identify the amounts of waste produced, their ability to recycle/manage the waste and look at their use of resources/inputs, including energy.

(ii) Identify a long list of viable green business models that can provide recycling and waste management services to businesses and institutions at Gewog, Dzongkhag or regional levels.

(iii) Identify six green business models from a range of potential circular economies and prepare business plans for each, including cost-benefit analysis to provide credentials for each one.

Volume 2: Climate-Smart Technologies Business Development

(iv) Identify a long list of Climate Smart Technologies promoted over the past decade over multiple sectors (agriculture, livestock, forestry, marketing/cooperatives, water and irrigation, education, health, farm roads, rural housing, etc.). Then, evaluate their viability and sustainability using a range of socio-economic criteria and rank them regarding their potential for promotion in Bhutan.

(v) Identify six Climate Smart Technology (CST) business models with significant potential for development at a local or regional level.

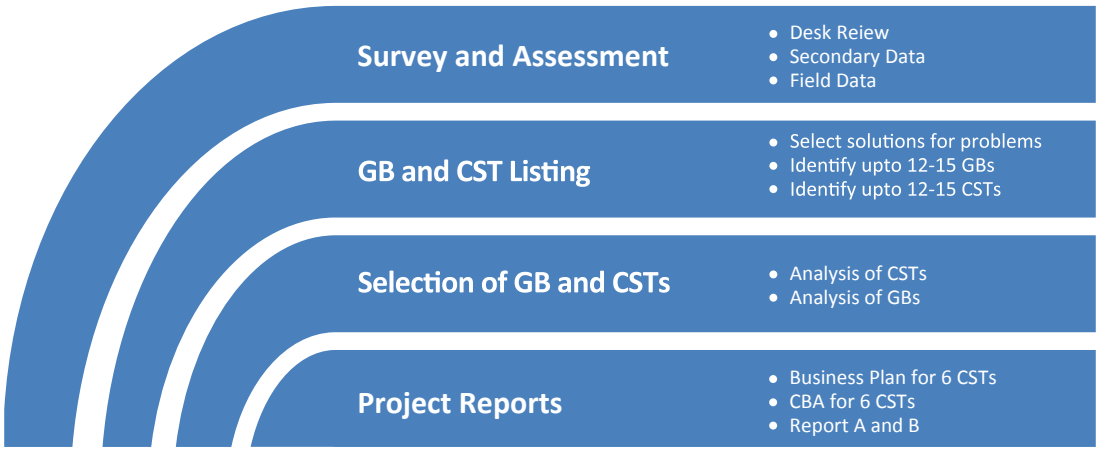
(vi) Provide business plans for each together with cost-benefit analysis (CBA). The models may include the wholesale and retail sale of CST, manufacturing of CST in Bhutan, hiring out of CST, providing maintenance services for CST, providing turn-key implementation of CST to interested stakeholders.

1.3. Methodology

The study involved four significant steps, as shown in Figure 1 below. The first is a survey and assessment of the issues in the business sectors (specifically the RNR sector), which was carried out through desk review, secondary data, and primary data collection. The study has considered issues and solutions for all the major RNR sectors from Agriculture, Livestock, to Forestry, considering renewable energy, waste management, and resilience to disasters.

The primary data collection was carried out for 8 Dzongkhags in different regions for Green Business (GB) and CST and consultation with central agencies in the areas and Thimphu.

Figure 1: Study Plan.



Then, based on the assessment, a list of potential GBs and CSTs was identified. The GBs and CSTs were assessed using SWOT analysis and other situational assessment tools. Then, based on the socio-economic criteria, the six most appropriate and viable GBs and CSTs were selected for cost-benefit analysis (CBA) and simple business plans.

Surveys and consultations were conducted through lifecycle activities/cradle-to-grave aspects of each sector, as listed below. For the assessment, respondents were requested to identify issues and challenges at each production step within their industry, while suggesting GBs and CSTs.

Figure 2: Sectors and Activities relevant to the study.

Sectors	Activities examined to assess waste or bi-products generated
1. Agriculture	Soil preparation; seed production; plantation; watering and fertilization; weeding; harvesting; post-harvesting and value addition; transportation; agro-processing, and marketing.
2. Forestry	Forest products; non-timber products; medicinal plants; processing; timber waste use; saw-mill waste use, environmental values/ services; and sustainable harvesting.
3. Livestock	Animal products; animal waste; storage and transportation; marketing; and human-wildlife conflict.
4. Energy	Small scale renewable energy production; energy conservation; energy efficiency; waste to energy; and clean energy at homes.
5. Waste	Segregation; collection; transportation; 3Rs; MSW; E-waste; C&D waste; wastewater; sewerage; and recovery.
6. Disaster	Disaster risk reduction initiatives, management, and post-disaster recovery.

1.4. Sample

There are more than 22,000 registered industries in the country as per the National Statistics Bureau of Bhutan in their Annual Report 2020. Out of which 866 are agro-based, 945 are forestry-based, 176 mineral-based, 17,578 services, 1,879 contracts, and 597 are others.

The sampling was based on the country's geographical coverage and socio-economic status. Accordingly, Eastern Region (Mongar and Tashigang), Central Region (Bumthang), Western Region (Thimphu, Paro, and Wangdue), and Southern Region (Chukha and Sarpang) were selected.

The sample selection was also based on Agriculture Research Development Centres (Wengkhar in Mongar, Bajo in Wangdue) and National Centre for Organic Agriculture at Yusipang in Thimphu. This is because they are the agencies involved in some way or the other in Green Business Development and Climate Smart Technologies in the respective regions.

Accordingly, on average, 5% of the representative population has been used to select the sample. The sample size for the survey is as shown below. The majority (80%) of businesses are in the service sector, such as travel agents, shops, and trading units, where the scope of intervention is minimal.

Figure 3: Survey sampling size, *Source: Statistical Yearbook, NSB, 2020*

Districts	Manufacturing & Service Industries	Sample
T/gang	508	39
Mongar	665	33
Bumthang	565	36
Wangdue	747	21
Sarpang	952	55
Chukha	1821	67
Paro	1117	34
Thimphu	4782	62
Total		347

For the surveys, the teams have selected RNR-related businesses where there would be possibilities for greening and making them climate-smart in consultation with the ARDCs in the regions. ARDCs are the regional centers for RNR research where they have better ideas on climate-smart technologies and green business in their command areas.

1.5. Field consultations

Based on the inception report and the sample size selected for the field survey, actual consultations were carried out for 8 Dzongkhags along with the selected Gewogs of the respective Dzongkhags.

The talks were made with the relevant officials of each Dzongkhag, such as District Agriculture Officers, Livestock Officers, Forest Officers, and officers in the Gewogs.

Then, to capture the existing business establishments for both Green Business and Climate Smart Technologies, consultations were also made with the relevant businesses.

Overall, the study could cover more than 225 business establishments in various sectors and 200 plus officials in multiple agencies within the limited time allotted.

Figure 4: Study-relevant sectors.

Dzongkhags	Gewogs	Business entities consulted	Central agencies consulted
Trashigang	Kanglung, Samkhar, Bartsham, Yangneer	Businesses (29)	Central agency officials Local leaders (13)
Monggar	Chali, Mongar, Chaskhar, Tsamang	Businesses (20)	Central agency officials Local leaders (14)
Bumthang	Chokhor, Ura, Chumey, Tang	Businesses (21)	Central agency officials Local leaders (17)
Wangdue	Thedtsho, Nahi, Phangyul, Ruepisa	Businesses (13)	Central agency officials Local leaders (12)
Thimphu	Chang, Mewang, Kawang, Genye	Businesses (35)	Central agency officials Local leaders (61)
Paro	Tsento, Wangchang, Lamgong, Dopshari	Businesses (23)	Central agency officials Local leaders (15)
Chukha	Phuntsholing, Chapcha, Darla, Bongo, Bjacho, Geling, Chukha	Businesses (36)	Central agency officials Local leaders (31)
Sarpang	Gelephu, Chuzaggang, Tashiling, Samtenling, Jigmecholing	Businesses (47)	Central agency officials Local leaders (11)

1.6. Study Limitations

The actual study period was allocated for three months from the second week of December 2020 until February 2021 as per the terms of reference. However, as soon as the contract was signed on December 8th, 2020, a national lockdown lasted until the first week of February 2021.

While carrying out the assessment and meeting stakeholders, we realized that several topics and technologies require more detailed research, in order to provide the granular detail for each GWM and CST. The scope of needs covered by these technologies is vast, both thematically and geographically.

In addition, many enterprises have little understanding of green waste recycling and climate-smart thinking. Even the staff of the Administrations at Dzongkhag or Gewog level have minimal knowledge about green business and climate-smart technologies.

Fundamental conceptual misunderstandings or low levels of comprehension were frequently noted in interactions with informants. For example, during the consultation workshops, people queried issues such as "what does green business mean?" and "what is the difference between *green business and climate-smart technology?"*.

The lack of participant understanding resulted in difficulties for informants to be clear about the focal points of the interview, and impeded obtaining the correct information from the field.

2. Analysis of business opportunities

2.1. Green Business Technologies Context Assessment

The survey found that among the businesses sampled, about 28% of households feel that they *"do not produce any waste"* because most of them re-use the waste in one way, or another. About 5% of the respondents have difficulty managing waste; instead, they do not know what to do with the waste. While most (67%) of them dump it through the municipal waste collection system, a few households have difficulty due to their area's non-availability of waste collection facilities.

However, almost all the businesses, about 80% of them, practice waste management principles such as organic waste used as manure (directly) or producing compost/bio-fertilizer, feeding cattle, and re-using by-products such as saw dust in poultry farms. In the case of mushroom cultivation, the waste generated is used to produce compost. Similarly, farmers use agricultural waste to produce organic manures, while others sell rice bran or straw to others making manures. Mostly, non-biodegradable wastes are given to municipal waste collectors or scrap dealers, who collect waste, and deliver it across the border to recycling plants in India.

At the survey time, the country's total solid waste generation in a day was 172 MT, 50% derived from households, followed by 40% from commercial units. In terms of waste composition, nearly half the total waste, or 46%, comprises food waste, indicating the potential for composting. Plastic and paper wastes make up 33% of the total waste, showing the potential for recycling or re-use[3]. This is true with the survey results from 8 Dzongkhags, where most waste is organic, used for manure and cattle feed.

Other waste, such as sawdust or wood-waste, are re-used to produce other small products or home decors. It is also being used in poultry farms or burned during the winter season. However, there are issues in some cases since saw dust and damaged wood logs are lying idle where communities complain about it. There are opportunities in the circular economy model since most of the recyclable waste goes to municipal waste dumping yards.

The assessment and short listing of these potential green businesses are preparing a series of training materials that DLG can use to create awareness of the potential of green firms amongst unemployed youth, women's groups, SME entrepreneurs, and Dzongkhag planners. Building this awareness through training, will require repeated follow-up actions, over successive coming years.

2.2. Potential Green Business Models

The assessment of Green Business potentials was carried out using the Triple Bottom Line approach viz. environmental, social and economic factors. Since there is no universal standard method for calculating the triple bottom line approach, we have used measurement indicators such as economic, financial, waste management, energy efficiency, gender parity, and access to employment to assess these aspects of the businesses.

In addition to that, the study team sought expert opinions from relevant officials from agencies who are already in the related sectors. The RNR sectors have already carried out several potential green businesses either in terms of research trials, pilots, or demonstration projects, but were not in a position to scale up nationally due to various factors, such as consolidating supplies in one location, access to finance, lack of skills, and limited interest from entrepreneurs.

---

[3] Waste Inventory Survey, National Environment Commission, 2019

Amongst the many suggested during the study, a long list of potential green businesses is identified as follows:

Model A: Production of **bio-degradable plates and cups** from *areca nut leaves* which are biodegradable, environment friendly, and has the opportunity to substitute imported plastic or ceramic containers or cups.

Model B: Production of **plastic farm fencing poles and HDPE pipes** *from plastic and PET bottle waste also* can substitute some imports.

Model C: Construct a supply chain system to replace a certain percentage of asphalt used within **road bitumen mixtures**, with a proportion *of plastic waste*. Bhutan imports about Nu.13,854 million[4] worth of Bitumen for road pavement purposes, part of which can be replaced by suitably processed plastic waste.

Model D: Another set of **wastepaper-based products** that can be trialed, will be making pencils, egg trays, and packaging materials – especially shopping bags - that can replace plastics bags.

Model E: Livestock rearing is part and parcel of the lives of rural households, and its products are necessary for all works of life. Accordingly, the opportunity is to use *waste generated by livestock rearing to produce* ***biogas for cooking purposes*** which can substitute LPG imported from India.

Related to the physical construction of a biogas production unit, there is also the opportunity to produce ***manure from slurry***. There is increasing usage of eco-stoves in the country from the point of energy efficiency and reducing dependence on LPG; however, there is no one to conduct repair and maintenance, which can also be an option to reduce eco-stove waste of various kinds going to landfill. ***Several viable businesses could also be established to provide an operation and maintenance service for Biogas Units and to stock the spare part inventories*** that are lacking now.

Also, the ***Upgradation and Bottling of biogas*** which can be traded in a form similar to LPG, into the market as a commercial product is a potential activity for investment. However, these industrial units require a range of necessary conditions that are not evaluated in this Report. The **upgrading and bottling of biogas is covered instead in the Report on EU-TACS A2.12 on Circular Economies.** These include the requirement for close proximity of many biogas digesters to feed one processing plant, a chemical engineering feasibility study, and Facility Design. Once in operation, this would enable contaminants in biogas to be removed to produce Compressed Natural Gas, otherwise titled Bio-CNG. The product then becomes safe and virtually identical in calorific yield and utility to the liquefied propane gas (LPG) tanks used widely across Bhutan.

Model F: Many household consumables, decorations, or home refurbishment/maintenance items are imported, easily produced by recycling plastic, bio-mass, *and other organic waste. Plastic or PET bottle waste* can make **home decor items such as baskets, walls for farm infrastructure, nursery plant pots**. Similarly, *bamboo waste from building construction* is another issue that can be translated into **decorative items or other household items such as toothpicks, baskets, fencing, plant pots, and others**.

Model G: Another significant waste is sawdust produced from saw mills and other wood waste from the wood-based industries. The opportunity is to deliver **fuel briquettes for heating or cooking purposes during winter**. *Biomass waste* can be used to make **fuel briquettes**, e.g., invasive plant biomass from converted fallow-lands, improved pastures, and forest edges when reforested.

Model H: Other *wood waste*-related business opportunities would be the production of particle boards, saw dust in the poultry farms, and bark and wood chippings as additions to **beds and borders in flower gardens**.

[4] Bhutan Trade Statistics 2019, Department of Revenue and Customs.

Model I: Organic waste is also an issue reported in almost all the existing businesses interviewed. A profitable green business can be established based on bio-fertilizers, **manure, or compost manufacture**. These can be bagged and sold for horticultural enterprises and local government parks. Similarly, it can be used for **processing animal feed and for mushroom cultivation**.

Model J: Production of mushrooms is found to have an excellent potential both in-country and in the international market, where medicinal mushrooms, oysters, shiitake, and button mushrooms are popular. The other mushroom-related business is that of spore production **for mushroom cultivation** since, at present, it is supplied by the government. Still, there is a market if the private sector can take up that business made from *organic and biomass waste*.

Model K: *Tree plantation* is also an opportunity in green business such as growing **Azolla plant for cattle feed and fertilizer, plantation of oak trees for mushroom cultivation** *through billets, and plantation of* **medicinal or aromatic plants** *used in diet, perfumes, or medicines*.

Model L: Agricultural crop waste or other organic waste can be utilized to make *bio-charcoal or bio products in the form of therapeutic or medicinal products*.

Model M: Due to the short shelf-life span, waste from local cheese can be produced into making *cheddar-type cheese with a longer shelf span of 2-4 months* that can also substitute imported cheese.

Model N: In terms of **perishable fruit waste**, there is a significant opportunity to make juices, jams, and dried fruits instead of dumping them as raw organic waste. Similarly, kiwi can be made into wine and jam to avoid waste, and excess tomatoes can be converted into sauces for cooking and canning.

Model O: Flower business (floriculture) is another opportunity that trades well in the domestic and international market, which can also be taken up using bio-fertilizer. **Flower waste** can be recycled in incense *sticks, perfumes, cosmetics, food, and textiles*.

Model P: Organic waste can also be used as a biofuel for generating electricity for the grid or converted to biodiesel, biogas, and ethanol, which can curb large-scale waste management issues in urban areas.

Model Q: It is envisaged that proper fruit tree orchard management practices and propagation protocols can increase carbon sequestration while gaining some socio-economic benefits. **Cultivating fruit trees** and their adequate management offers an opportunity to extend and maximize fruit productivity and carbon storage over a prolonged period.

Model R: More comprehensive cultivation and improved management of fodder provide adaptation and mitigation opportunities. Still, these are generally not well quantified. There are clear opportunities for increasing productivity and resilience through diversification, genetic improvement, improved farm-input delivery, and better modeling of future scenarios.

2.3. Selection and ranking of Green Businesses Technologies

The ranking of potential Green Business Models was made based on the multi-criteria indicators as shown below to select six viable and sustainable businesses by assigning weightage 0-5 on importance and relevancyr.

a) *Employment generation*
b) *Import substitution*
c) *Environment friendly*
d) *Waste material usage*
e) *Income generation*
f) *Use of local materials*
g) *Probable access to finance*
h) *Sustainability*

Accordingly, business plans are prepared for each of the seven businesses selected to prepare training materials for the proposed DLG training and awareness program for educated rural youth, women's groups, and Dzongkhag planners, as shown in Volume 2 report.

The seven Green Businesses selected for the study are:

GW Model 1: Packaging materials made from paper waste and cardboard
GW Model 2: Bio-fertilizer, bio-manure, or vermicomposting from organic waste
GW Model 3: Bio-degradable plates or cups from areca nut leaves
GW Model 4: Mushroom cultivation using waste oak woodblocks & inoculated mushroom blocks
GW Model 5: Pencils from wastepaper
GW Model 6: Bitumen for road pavement from plastic waste
GW Model 7: Briquette production from sawdust (briquettes can also be made from agricultural waste such as straw or chipped biomass, e.g., from cleared fallow land areas or removal of diseased and overmature fruit trees

A further green waste option of molding fencing poles from plastic waste is described in Part B of this set of reports, as a Climate-Smart Technology, due to its close relationship to the demand for fencing to reduce human-wildlife conflict.

For a more detailed analysis of these technologies, reference is made within the **Report – Volume 2 - Green Business and Waste Opportunities**.

2.4. Climate-Smart Technologies Contextual Assessment

Climate-Smart Technologies (CSTs) have been introduced, piloted, demonstrated, and out-scaled in Bhutan, mainly during the 11th and 12th FYP periods. In 2015-2016, the Council for Renewable Natural Resources (RNR) Research, MoAF launched the Climate Change Adaptation Program (CCAP), under which efficient irrigation systems for horticulture production were promoted in four Dzongkhags in the Kurichu River Basin[5].

Efficient irrigation systems included sprinkler irrigation, drip irrigation and electric pumps. These irrigation systems have been combined with poly-tunnels and greenhouse to enhance productivity and improve food security.

Other CSTs include farmyard manure application and mulching, integrated soil fertility management, integrated pest management, sustainable land management, development and use of pest and disease tolerant varieties, use of drought-tolerant varieties, ridge plants systems, use of organic fertilizers, agroforestry, promotion of biogas technology, cross-breeding, and high-quality feed for livestock.

Based on the analysis of the desktop review, literature review, survey data, and the consultation workshop, the following challenges and issues have been identified:

1. *Transportation of raw material and products to market*
2. *Lack of seed/seedling such as mushroom seed, livestock feed, and its cost*
3. *Waste management, including segregation issues*
4. *Low quality of raw material for dairy products*
5. *Shortage of labor, egg tray supplies, water problems, and human-wildlife conflict*
6. *The excessive cost of technology, lack of technical knowledge, and rampant fuelwood use for cooking and heating.*

Accordingly, there is a need to identify the scale of demand and specific requirements of climate-smart technologies to mitigate the above problems and issues to form the basis for private sector service delivery businesses.

[5] MoAF (2016) State of Climate Change in Bhutan Report.

2.5. Potential Climate-Smart Technologies

Among the extensive range of climate-smart technologies identified during the study, around 17 CSTs were selected/suggested by stakeholders because they were well-known climate-smart solutions for the challenges listed above. It was found that **greenhouses and poly-tunnels** were the most commonly known CSTs to control the growing of off-season vegetables, especially in the colder regions.

Many respondents had also received a government subsidy for the greenhouse structures. Therefore, this study has looked into **hydroponics and aquaponics** as more innovative technologies to meet this demand and promote it to the next level. The survey has found that hydroponics and aquaponics are being piloted in the RNR centers across the country.

These climate-smart technologies are necessary for extending the growing period, especially in Bhutan, where the total arable land is disproportionately small compared to the number of people depending on agriculture. These **climate-smart farming systems also cut down on water usage and land requirements**. They are also efficient in **cutting down the consumption of agrochemicals such as fertilizers, herbicides and pesticides**, making produce increasingly organic.

Farmland pooling and farm mechanization were also explored to increase productivity and yield. Bhutan farmers are small land holders, so they do not have enough incentive to invest in innovative climate-smart equipment and machinery. Although the northern region is not suitable for mechanization given the terrain of much of the land, **Bhutan's southern belt has significant potential for farm mechanization**. Based on suggestions from the consultation workshop, the study has explored two options in this criterion: (i) farmland pooling or (ii) pooled farming pieces of machinery and power tools. The use of clean technologies such as battery-operated seed planters and tillers, solar-powered cold stores, and other similar CST technologies reduce fossil fuel usage from farms, reduce costs, and contribute to the development of climate-smart villages.

The **shortage of accessible water** has been recognized as a significant issue by the survey respondents and officials from the central agencies during the consultation workshop. A hydram pump was piloted in Rubesa, Wangdue, in 2019 for irrigation by Bhutan Water Partnership[6] with the help of the UNDP SGP program[7]. The hydram pump as demonstrated by the Barsha pump are explored in this study as affordable and climate-change friendly approaches to improve accessibility to water, based on the experience by Bhutan Water Partnership.

Additionally, to combat water shortages in the residential and institutional sectors, **rainwater harvesting** has been studied. Rainwater harvesting systems are simple systems that can be easily adapted to the local conditions for increased water sources, especially during the summer. These systems offer additional values as mitigation against floods. These, combined with drip irrigation, sprinkler irrigation, and Android-based water delivery control system, are incorporated to improve water-use efficiency.

Accordingly, 17 CSTs were studied individually based on the primary purpose of the CST, current scenario for the technology, expected benefits, inputs required, expected outputs, cost, employment opportunities, challenges, and limitations.

The following 17 Technologies are profiled in **Volume 3**, **titled the Report on Climate-Smart Technologies**, with each CST described in a table, fitted onto one page.

CST Profile 1. Hydroponics
CST Profile 2. Hydraulic water pumps for irrigation
CST Profile 3. Solar cookers
CST Profile 4. Rainwater harvesting
CST Profile 5. Cold storage unit (large-scale or small-scale; with solar power)

[6] https://www.facebook.com/watch/?v=487265755700994
[7] SGP 2019 https://sgp.undp.org/spacial-itemid-projects-landing-page/spacial-itemid-project-search-results/spacial-itemid-project-detailpage.html?view=projectdetail&id=27651

CST Profile 6. Solar-powered electric fencing
CST Profile 7. Aquaponics
CST Profile 8. Food processing unit for chilled and frozen fruits and vegetables
CST Profile 9. Vertical gardens for urban spaces and small kitchen gardens
CST Profile 10. Locally-produced eco-poles for a range of farm infrastructure
CST Profile 11. Water-efficient irrigation delivery systems: Drip irrigation
CST Profile 12. Support systems for biogas units
CST Profile 13. Greenhouses - heated and unheated
CST Profile 14. Polytunnels and kitchen garden cloche systems
CST Profile 15. Electric crop dryers
CST Profile 16. Pooling of farm machinery and power tools using battery-operated machinery
CST Profile 17. Farming mechanization through farmland pooling

For a more detailed analysis of these technologies, please refer to Volume 3.

The assessment and short listing of these potential climate-smart technology services businesses are preparing a series of training materials that DLG can use to create awareness in the potentials for climate-smart technology service delivery businesses amongst unemployed youth, women's groups, SME entrepreneurs, and Dzongkhag planners. This awareness training is a follow-up activity to this research study.

2.6. Selection and ranking of Climate-Smart Technologies

The **final selection of six Climate-Smart Technologies** was made through Multi-Criteria Analysis, such as cost, benefits, local inputs, employment, and requirement of technical expertise for each of the CSTs.

Stakeholders were particularly interested in the following CST:

CST Model.1 Hydroponics and aquaponics business systems
CST Model.2 Water pumps for irrigation
CST Model.3 Solar cookers for nomadic communities
CST Model.4 Rainwater harvesting
CST Model.5 Small (on-farm) and medium/large (private sector) scale cold storage (running on mains and solar power), plus food processing unit - frozen fruits and vegetables
CST Model.6 Solar (and mains) electric fencing to combat human-wildlife conflicts

All six CSTs (listed above and described in Volume 3) have the potential for private sector involvement in up-scaling for rural communities in Bhutan.

Properly branded businesses with workable business plans can: (i) supply materials, equipment, and machinery; (ii) provide skills and training to those purchasing the system; (iii) provide contracts for operation and maintenance (O&M) services; and (iv) provide turn-key installation of the system if needed (and also provide system rental options if preferred by the users).

3. Findings and challenges in business development

3.1. Capacity, Institutional and Policy Gaps

1. **A green business is a business functioning in a capacity where no negative impact is made on the local or global environment**, the community, or the economy. A green business will also engage in forward-thinking policies for environmental concerns and policies affecting humanity through introducing, e.g., circular economy principles aimed at recycling bi-products[89] and adopting waste management technologies or strategies. Attempts have been made since the 10th FYP, and through NGOs' efforts to promote green investment in Bhutan; however, private sector development has stayed mainly at the piloting and demonstration stages primarily due to problems with achieving economies of scale and in finding interested entrepreneurs and investors.
2. **Climate-Smart Technologies are those technologies aimed at mitigating and adapting to the impacts of climate change**. While CSTs create opportunities to address climate change challenges, they also contribute to the economic growth and development of the Renewable Natural Resources (RNR) sector. For the RNR sector in Bhutan, the benefits to the agriculture, livestock, and forestry sector are critical. They are also viewed considering possibilities for mitigating GHG emissions, and enhancing resilience to the pressures of climate change. The 11th and 12th FYPs at MoAF have mainstreamed several CSTs with farmers, herders, and foresters; however, most support is provided through government agencies. Many of the CSTs require: designs, equipment, machinery, technical assistance, delivery of services, training, co-financing, and operation and maintenance (O&M) systems, as well as monitoring by external agencies. To out-scale CST that has already been successfully piloted and demonstrated during the 11th and 12th FYPs, there is a significant potential for the private sector to become more involved in the out-scaling process through the provision of materials, equipment and machinery, maintenance and spare part services, and design and turn-key implementation of projects.
3. **Primary data collection was carried out** in 8 Dzongkhags (40% sample) in different regions of Bhutan for both Green Businesses (GB) as well as Climate Smart Technology Businesses (CSTB). Consultations were also held with Central Agencies in the Regions and at Headquarters in Thimphu. Around more than 230 businesses in various sectors and more than 200 officials from multiple agencies, Civil Society Organizations (CSO) were consulted for the study.
4. From a long list of GB and CSTB identified by stakeholders during the field surveys and from desk studies carried out by the study team members, a multi-criteria selection analysis was used, and **the most viable and profitable businesses for each category of business were selected – GB (providing recycled products to the broader community) and CSTB (providing climate-smart products and services delivery to rural households)**.
5. The GBs (seven in total) and CSTBs (six in full) were initially assessed through SWOT analysis and other socio-economic indicators and were further analyzed through formal or informal cost-benefit analysis (CBA). Simplified business plans were prepared for three examples as pre-feasibility designs.
6. The **capacities at MoAF, DLG, and Dzongkhags to promote green businesses** are still limited, mainly due to the following gaps in the institutional framework:

[8] EU (2015) Opportunities for Agriculture and Forestry in the Circular Economy
[9] EU (2013) Converting to Ecological Recycling Agriculture and Society: Environment, Economic and Sociological Assessments and Scenarios

Figure 5: Capacity Limitations at MoAF, DLG, and Dzongkhags to promote Green Business Models and gaps in the institutional framework.

- There is **no clear policy framework, unclear strategies** (fragmented if any), and no processes or procedures for green business and CSTs business development.
- **There is a lack of a clear green business focus in the 12th FYP at** MoAF and DLG.
- Poor **environmental mainstreaming** in general, especially concerning circular economies, waste recycling, and by-products from existing RNR businesses
- All entities involved have **limited identification and designs of sustainable green businesses** suitable for promotion and adoption by entrepreneurs. There is a significant lack of a **green business development process** and set of procedures.
- Lack of a **rigorous green business multi-agency stakeholder coordinating framework** both (1) **vertically across Gewogs and Dzongkhags** and (2) **horizontally from local officers up to Minister**.
- Lack of **Local Economic Development Plans** in many Dzongkhags where green business strategies appear.
- Lack of guidelines on how **green businesses can fit within the "Economy" and "Environment" grants** set up for and by Dzongkhags.
- Lack of **trained staff** in green business promotion at Central and Local levels.
- Understaffed **Investment Facilitation Section** (IFS) at PPD, MoAF, where green businesses related to the RNR sector could be promoted.
- **Lack of knowledge about green businesses at the village level**, as well as amongst many extension workers and Dzongkhag officials, makes it difficult to promote (through the private sector) investment in green businesses.

7. In the same way as outlined above, the **capacities at MoAF, DLG, and Dzongkhags to promote CSTs and related businesses** and CSTs (Table 5) are limited by the following institutional and policy gaps:

Figure 6: Capapacity Limitations at MoAF, DLG, and Dzongkhags to promote climate-smart technology businesses and gaps in the institutional framework

- While there are clear policies and strategies for promoting climate-smart technologies (CST) at MoAF from the 11th through to the 12th FYP, most relate to promotion through the research and extension services at MoAF. Piloting and demonstration are well advanced; however, **to out-scale some of the successful technologies will require more involvement by the private sector in the future**.
- There is a direct integration of climate change adaptation technologies in the 12th FYP, evidenced by the inclusion of a separate program, *"Climate Smart and Disaster Resilient Development Programme"* (MoAF Programme 5); however, reading through the Key Result Indicators (KRI), it is clear that the **targets proposed were minimal and can only act as demonstrations in most cases** (except in the case of promotion of bio-gas units which are at an up-scaling stage).
- While mainstreaming of climate change adaptation has been in place during the 11th and 12th FYP at MoAF, the use of the private sector to deliver technologies, provide operation and maintenance support, and provide turn-key implementation services for farming households remains very weak.
- **Identification and design of climate-smart technologies are well established at MoAF through the Agricultural Research and Extension Division** (ARED) and equal divisions under the Department of Livestock and Department of Forests and Park Services. NGOs and do-

nor-assisted projects also provide support.

- There is a **lack of a climate-smart technology business promotion and development process within MoAF**. This is an area that the Policy and Planning Division could undertake since it is a cross-cutting issue. Successful promotion of biogas by the private sector in Bhutan is one example of how upscaling a new technology can take place, viz. *National Biogas Implementation Strategy* through the Department of Renewable Energy (MoEA, 2020).
- Lack of an **active CST business multi-agency stakeholder coordinating framework** (both vertically and horizontally) limits the possibilities of the private sector involvement in upscaling a wide range of new innovative technologies.
- Lack of **Local Economic Development (LED) Plans in almost all Dzongkhags** where climate-smart business strategies appear. However, in some Dzongkhag annual plans, budgets are available to support some CST, e.g., reducing human-wildlife conflicts in farming areas.
- Lack of guidelines on how **CST businesses can fit within the "Economy" and "Environment"** grants set up at Dzongkhags through the recent decentralization process.
- The demand for climate-smart technologies does not always meet what is being promoted by the researchers at MoAF. **Piloting and demonstration do not always translate into the potential for up-scaling**. This is exemplified in the case of water supplies for irrigation. The farmers are looking for additional sources to supply command areas, such as hydraulic pumping systems from rivers, while researchers are looking at the efficiency of water use through Android-controlled water delivery systems to fields.

8. This study has focused on identifying sustainable and viable business opportunities for a range of entrepreneurs. The **Department of Local Government could use findings from the study to develop training concepts and materials for a training course for various stakeholders later in 2021**.
9. This study has focused on the micro-level for DLG to promote GB and CST at the Dzongkhag levels. A follow-up study to be carried out by MoAF in late 2021 and 2022 and onwards will focus on circular economies and waste recycling for each RNR sector at the macro-level to develop macro models for the RNR Vision 2040 Strategic Direction. This study will propose strategies and action plans/programs for MoAF. Consequently, **coordination and correlation between the micro-level modeling in this study and the macro-level Cicrucal Economy programming and numerous types of follow-up studies will be necessary** and is a clearly-identifiable critical success factor.
10. Presently, there is a **need for more policy, strategy, process, and guidelines for developing green businesses and climate-smart technology businesses, either at MoAF, DLG or the Dzongkhags**. Piloting of GB and CSTB is in its infancy, and only a few pilots have been carried out, mainly by Non-Government Organizations and international donors.
11. There has so far been **insufficient coordination and inter-ministerial cooperation to carry forward GB and CSTs initiatives**. Several agencies are piloting green businesses, organic farming, and adopting climate-smart technologies. However, there is a lack of knowledge sharing, coordination and cooperation due to agencies' prevalent "silo mentality."

3.2. Business Planning and Management Issues

Based on the consultations with various business establishments, relevant stakeholders at Dzongkhag and Gewog levels, and Central Agencies, the following are some of the main findings, issues, and challenges in establishing businesses related to Green Business or adoption of Climate Smart Technologies in Bhutan.

12. During the initial investment phase, the green business and CST sub-sectors face challenges due to a **lack of access to flexible finance**, which may demotivate potential entrepreneurs. Even if they can obtain the required credit from their chosen financial institution, repayment starts immediately after establishing the green business, which is often not possible. For example, small industrial units take time to launch and to produce their output product. Any payments from products and services sold on the market are often not instant.
13. Each **type of business faces the complexities of locating itself within its value chain** (VC) system, involving suppliers of inputs and buyers. These VC actors themselves are often divided into segments concerning the proposed green business. For example, cold storage facilities will depend on food processing units that cut, dimension and package the fruits, vegetables or meat and dairy products. The food processing units will rely on market suppliers who operate on varied scales, can promise to deliver specific volumes, to a certain quality, over a particular period of time.
14. A particular issue is the **necessity for contracts of various kinds and trust levels between actors to become established**. Each green or CST-type business will need to generate a functioning arrangement of agreements, promises to purchase, promises to deliver, stable costs of inputs, and capacity to charge prices to wholesale or retail-level purchasers for the output product, that give every agent some profit margin, or "cut of the cake". All this takes time, effort and policy support for the pieces to fall into place.
15. One of the issues in the RNR sector is that **time to return on investment can be extended** (from at least six months for annual crops to more than 20 years for tree plantations). In the case of GB and CSTB, this will vary depending on the need for infrastructure, machinery, and equipment. Of course, farmers and rural young people prefer rapid income and profit rather than waiting for several years. This is also reflected in demand for loans through the rural financing banks in Bhutan, with most loans being **"production loans"** that are paid off in one year.
16. In contrast, long-term loans for significant investments are rarely taken. These require guarantees in terms of capital or other forms of assets such as bonds, certificates, titles and deeds, which would become the lender's property if the loans were defaulted upon.
17. One of the most significant issues and challenges is **marketing** due to various trade restrictions, transportation issues, or government regulations. This will be especially the case for new products which do not have a well-established, fully-functioning value chain.
18. Even when considering the issue of vegetables (a well-established agricultural product), on the one hand, farmers often cannot market their products effectively, some of which go to waste at the farm gate. At the same time, **during the mid-monsoon glut of produce, some households have an excess of fresh vegetables in the urban centers**.
19. The commonly known risk experienced by all existing businesses is **competition from the international market**. Imported goods are cheap and preferred by the customers than those produced internally, especially if they are more expensive.
20. It is challenging **to sustain a business based on the domestic market alone due to small economies of scale**. It also needs to compete with the international market to do well. In addition, any GB exporting to the global market level will face many hurdles such as trading regulations, meeting the international quality standards of production, certifications, and other administrative requirements. The RGoB can proactively reduce barriers and cut any excessive red tape.
21. **AS shown in Volume 2 and Volume 3, the study's cost-benefit analyses were carried out for some technologies**. Due to the lack of rigorous evidence-based data in Bhutan for some of these technologies, data were collected from neighboring countries, especially India and Nepal, when needed.
22. The templates for the CBA provide the basis for future training and awareness creation with SME – youth groups, women's groups, and existing private businesses – to introduce them to the **principles of business planning through identifying input costs, demand for products, and potential volume of supplies**.

23. **The data accuracy for the estimates made for key variables for each green business model (i.e., inputs costs) would need to be assessed at the full feasibility (location specific) and business planning stages**. The data in this study should be *considered pre-feasible and open to further refinement once evidence-based statistics become available at a future planning stage.* These exercises would be carried out together with interested entrepreneurs following on from awareness training courses.

3.3. Raw Materials, Waste and Recycling Issues

24. Constant s**upply of raw materials** (on time and in the correct quantity) is always an issue with the existing RNR suppliers, retailers, or traders/businesses, even with a well-established value chain. For products that come from green companies, where there is no well-formed value chain, it is even more difficult, e.g., raw materials for particle-board production are in short supply, even to supply the single large-scale factory already in production. It is recognized that all start-up businesses related to waste management should be small-scale and in line with the supply chain for raw waste materials.
25. Medium and larger-scale companies can only go ahead when a reliable source of waste is available, sustaining a waste managing business in rural areas will depend on the **willingness of the people to give away their waste**, as most of them prefer either burying, burning, or sending to landfill (as per tradition). Also, social stigmatization may arise when admitting to having accumulated excessively elevated levels of waste.
26. It will be challenging to convince farmers and rural households to manage their generated waste via a newly formed GB. This is partly due to a lack of education and limited awareness. There is a **lack of raw materials to make organic compost in one location**, and also, it isn't easy to obtain such compost from the community easily. This will also apply to other waste materials which will need to be transported to processing sites. Feasibility studies will be required that are site-specific.
27. The development of **municipal-level legal instruments** that require excess vegetable and animal waste – for example, to be provided by households to green businesses every week – should be examined.
28. Especially during the winter/dry season, there is lower production of livestock products due to the shortage of feed and fodder. Mechanisms for using agricultural waste (collected during the peak growing season) such as **recycled hay or silage can be promoted for farmers involved in stall feeding livestock**.

3.4. Demand for Climate-Smart Technologies

29. Demand for CSTs services is high; however, the **high cost of equipment and maintenance limits the willingness of villagers to adopt some popular technologies**, especially without some form of co-financing.
30. Water shortage is the main problem during the winter season since most agricultural productions depend on rainfall. Therefore, a range of CSTs that singly - or organized as a system - can alleviate water shortages, are a **crucial need for most farmers**.
31. Human-wildlife conflict is a significant issue in almost all Dzongkhags. Therefore, **most farmers assigned a high priority to any CST that alleviates human-wildlife conflicts**. Many Gewogs have started electric fencing to combat human-wildlife conflict, but the investment costs often become prohibitive due to the scattered nature of villages and farmland.

3.5. Private Business Stakeholder Issues

32. Since most of the **potential business stakeholders lack knowledge on how to prepare green and climate-smart technology business plans** and are new to the concept of GB and CSTB, they are reluctant to accept these new ideas without some form of insurance or guarantee against losses if the business fails to achieve its targets.
33. In addition, **government institutions are unsure of the benefits of GB and CSTB** and may be/are unwilling to assist potential entrepreneurs.
34. There is a **lack of interest among unemployed and educated rural youths** to accept agricultural work as a profession, since they lack appropriate information about the genuine prospects under agricultural/RNR development. This is certainly also the case for GB and CSTs, to which they have had little exposure.
35. There is **resistance among the potential business entrepreneurs to involvement in GB and CSTs** due to a perceived lack of a guaranteed market with the high cost of production and increased investment in the businesses, along with limited business ideas and skills.

    Potential entrepreneurs, farmers, and rural households face **challenges adapting to modern equipment and machinery, making it harder for them to** enter into more significant investments and industrial production, even if considered to be at a small scale in the South Asian regional context.
36. Setting up business establishments, mainly in production areas, is a concern since most of them, especially the youth, have **limited land** in the rural areas. Securing land both for youth groups to practice agriculture, and setting up any manufacturing plant, will be an issue).

4. Recommendations

4.1. Development of plans and frameworks

1. **The design and adoption of *"Circular Economy, Green Waste and Climate Smart Technology Industrial Investment Plan"*** is vital to organize green investment and climate-smart technology investment, to provide clarity to all types of targeted stakeholders on strategies, targets, methods, and procedures, that together will enable the active involvement of private businesses, state-owned enterprises, women's groups, youth groups, farmer groups, and cooperatives, etc. to become engaged in all types of enterprises under the umbrella-term of the "Circular Economy".
2. **MoAF and other stakeholders should enhance the institutional framework for advancing green and climate-smart technology investment** through various mechanisms. This will necessarily include: (i) developing a multi-agency policy framework; (ii) strategies to provide direction; (iii) processes and procedures (from identification, design, feasibility, business plans, service delivery to supporting actualization of businesses); and (iv) monitoring, evaluation, and best practice learning).
3. Develop **a planning process for identifying potential green and climate-smart businesses and assisting entrepreneurs in employment promotion** is a significant gap that needs filling. This can be done by building collaboration and establishing partnerships between MoAF, DLG, other institutions, and the Dzongkhag administrations. Suggestions for this have been made by the SKE for MoAF under the EU-TACS project in *Dialogue Briefing Note No.11 and should* be followed up by the concerned institutions. The MoAF, DLG, and Dzongkhag administrations are recommended to cover the period up to 2040, which should cover the upcoming two 5-year plans.
4. **Greening approaches in the investment plan** should cover all RNR sectors: agriculture, livestock, forestry, marketing, and farm infrastructure (buildings, roads, irrigation, energy, mechanization), as well as other Circular Economy technologies. **All plans for Green Business Development and Climate Smart Technologies should be included in the annual work plans of the respective departments and the Dzongkhags** with clear objectives. The same can also be reflected in individual Annual Performance Agreements.
5. A **multi-agency framework for 'enhancing accessibility to GB and CSTs services' is recommended** to develop a multi-agency framework for start-up private SMEs, start-up CBI, and existing adopter businesses. This will involve the development of a multi-agency framework through coordination from the Policy and Planning Division, MoAF in collaboration with the Department of Local Government, and individual Dzongkhags (other agencies may be co-opted depending on the type of products or services).

   Any new framework will need to provide/define accessibility support linkages for entrepreneurs who will prepare their business plans. Accessibility support will focus on connections to and sources of (i) finance (through DHI Bizz hub, CSI Bank, Crowd Funding, Loden Foundation, among others, support from donors such as EU and other green investment funds); (ii) equipment and machinery suppliers; (iii) training and skills providers; (iv) technical assistance; (v) branding and marketing of product and services to be provided by entrepreneurs; etc.).

4.2. Start-up process

6. The stakeholders involved should realize that the **size of businesses suitable in the Bhutanese context will vary depending on the target key investment area that is chosen**. The size of industries or companies will necessarily be skewed towards smaller sizes, rather than medium to larger sizes, due to the small population in Bhutan, the limited financial management capacity of entrepreneurs, and limitations on exports due to competitive disadvantages. It is recommended that **target entrepreneurs should initially be focused on the following: existing private businesses, state-owned enterprises, educated and unemployed youth, women's groups, community-based industries, cooperatives, CBO/NGO**.

The following table illustrates the steps in the entire process:

Figure 7: Steps to be taken in the development and transfer of GBMs and CSTs.

STEP1: Identifying green and climate smart technologies businesses with market potential	• MoAF and DLG prepare long list of Green and Climate Smart Technologies Businesses • Multi-criteria ranking system to select those with high market potential • Short list for pre-feasibility studies to be carried out by local consultants
STEP2: Preparing Feasibility Studies for Potential Green and CST Businesses	• MoAF and DLG select enterprises with higher potential for success in the Bhutanese context • Guidelines for preparing feasibility studies prepared by Investment Facilitation Section (IFS) at PPD MoAF • Identify local consultants to carry out feasibility studies
STEP 3: Preparing Green Business Plans	• Guidelines for preparing Business Plans developed by IFS at PPD MoAF • MoAF and DLG prepare task forces to prepare draft Green and CST and Circular Economy Business Plans for viable projects based on Feasibility Studies • Business Plans shared with key stakeholders (Dzongkhags, potential SME entrepreneurs, existing businesses, SOE, banks etc.)
STEP 4: Enhancing Accessibility for start-up SME and existing businesses	• Green and CST business plans supported through investment promotion activities at IFS, DLG and Dzongkhags • IFS, DLG and Dzongkhags provide accessibility support/linkages for business plans (finance, machinery suppliers, training, technical assistance, branding etc)
STEP 5: Putting into Practice Sustainable Green Business and Circular Economy Plans	• Start-up SMEs identified by Dzongkhags and DLG through various advertising and linkaging procedures. • Exisiting businesses screened by Dzongkhags and DLG for potential in business management and in capacity to adopt and adapt already prepared business plans to advance green bottom lines • Dzongkhags use Economy and Environment Grants to kick start projects • Dzongkhag planners monitor and coordinate new green business development

7. Dzongkhags will need to kick-start GB and CSTB and other Circular Economy plans through their **Local Economic Development Plans** (LED) and the LG "economy" and "environment" grants, together with being responsible for monitoring and evaluating the projects. Training of Dzongkhag planners and critical officials will be required through DLG and other agency interventions.
8. It is recommended that **feasibility studies are prepared for potential and viable GB and CSTs** where MoAF and DLG can jointly select enterprises with higher potential for success in the Bhutanese context. The PPD should prepare the guidelines for preparing feasibility studies, MoAF with assistance from local consultants who can carry out the feasibility studies on behalf of MoAF, DLG, and the Dzongkhags concerned.
9. **Support to update green waste and CST business plans will need to be provided at the local levels**. Start-up private SME/CBI/existing businesses need to be identified by Dzongkhags, Gewogs, Thromdes, lead by DLG and others identified through various advertising and linking procedures.
10. Dzongkhags and DLG shall screen the existing businesses for potential in business management and capacity to adopt and adapt already prepared business plans to advance green bottom lines (financial, environmental, socially equitable base-lines). Dzongkhags are expected to facilitate access by entrepreneurs to "Economy" and/or "Environment" Grants to kick start projects. The **Dzongkhag planners shall monitor and coordinate any new GB and CSTB developments within their control area**. After consultation with relevant local stakeholders, dzongkhags will ensure that GB and CSTB are included in their Local Economic Development (LED) plan targets.

4.3. Areas for investments and up-scaling

11. It is recommended that investment in the **recycling of wood-based waste** be given a high priority. Several important biomasses are: (i) sawdust (used for fuel briquettes and hardboard manufacture); (ii) off-cuts from sawmills (for fencing, handicrafts, raised beds for nurseries); (iii) over-mature and diseased fruit tree orchards (used for parquet flooring, handicrafts, bi-charcoal); (iv) invasive plants in farmland, pastures and forest edges (used for fuel briquettes, bio-building bricks); (v) bamboo poles from former building sites (used for fencing, plant pots, handicrafts, spoons, knives, forks, socks, clothing, toothbrushes, toothpicks), and (vi) large leaves from areca nut trees (bio-degradable plates and cups).
12. Further investment (out-scaling between communities) in **technologies to reduce human-wildlife conflict** in farming areas with a high percentage of crop and livestock losses, e.g., electric fencing (mains or solar operated), net fencing, live fencing, off-farm conservation feed systems for wildlife. Service delivery to farmers can include equipment and materials, maintenance contracts, and turn-key installations. Some Dzongkhags have already included this technology as a priority under their annual plans for "environment grants."
13. Investment in **recycling organic waste** from farm crops (biomass waste), rural households (garden and food waste), and small businesses (various types of waste) can be used for: (i) bulk raw compost for farms and amenity areas; (ii) processed bio-compost/ bio-fertilizer for seedling production and floriculture; and (iii) vermiculture composting. Community-based industries can be established where there is sufficient organic waste in one locality and where organic waste is scattered with transport issues. Processing can be done at the site.
14. Investment in **recycling waste paper and cardboard** can be promoted through a network of collectors. A range of products can be made e.g., for egg tray manufacture for poultry farmers (only one production plant in the country and the need for 6 million egg trays annually is hardly reached from internal sources), pencil making (import substitution benefit), shopping bag manufacture (divesting businesses from using plastic bags). These activities would be suitable for women's groups, unemployed educated youth, and cooperatives to diversify their income base.
15. Investment in **recycling plastic waste** can be promoted through a network of collectors (soft plastic, PET bottles, hard plastics). Piloting of many recycling actions has already taken place, mostly through NGOs. Examples include (i) bitumen for rural and farm roads from plastic inclusions; (ii) plastic farm fencing poles; (iii) HDPE pipes; and (iv) plant pots for nurseries from used PET bottles. These activities can be adopted by small and medium-sized community-based or private enterprises.

16. Up-scaling of investment is recommended in **tree planting and conversion of over-mature and diseased orchards** (for farm forests, agroforestry, community amenity forests, conservation purposes) to be carried out by the establishment of private nurseries, tree surgeon services, invasive/unwanted biomass removal businesses. Emphasis should be placed on the diversification of fruit farming for climate resilience. Businesses providing support for inputs delivery to fruit growers would be a key area to explore.

17. Up-scaling and privatization of investment in **products from and services for by-products from stall feeding of livestock**, e.g., excess slurry for Farm Yard Manure (FYM), biogas manufacture for cooking, lighting, and heating, and equipment and materials services for biogas systems. Biogas bottling by rural youth groups can be further explored as suggested by the Department of Livestock. Biogas production on farms and institutions has been promoted over the past 10-15 years and has been highly successful. Further exploration of how to privatize delivery and maintenance of biogas plants and bottle biogas is required at the Department of Livestock.

18. It is recommended that up-scaling in investment for already well demonstrated **renewable energy sources** occur at rural household, village, Gewog, and Dzongkhag levels, e.g., solar, wind, and mini-hydro systems. These are especially suitable in off-grid areas and for standalone small industrial units. It is recommended that investment in **clean energy technologies** (non-fossil fuel) should be piloted, demonstrated, or up-scaled for home appliances, farm equipment, and farm machinery that use direct mains electricity (sourced from HEP or other renewable energy sources). This would include promoting standalone solar or battery-operated equipment and types of machinery such as (i) battery-operated cultivators/tillers; (ii) solar-powered seed sowing machines; (iii) solar lighting/cookers; (iv) battery operated mini-tractors; (v) solar operated grain dryers; (vi) solar-powered cold storage units; (vii) battery-operated wood chippers; and (viii) solar-powered heated greenhouses. Clean energy technologies will reduce the reliance on imported fossil fuels such as diesel, petrol, kerosene, and gas and reduce pollution and noise.

19. Further investment (demonstration and up-scaling) in **water-efficient technologies** to combat depleting water sources caused by climate change (drought, drying springs, reduced river flow, irregular monsoon seasons) should occur through demonstration or up-scaling. These technologies would include: (i) water harvesting; (ii) drip irrigation; (iii) sprinkler irrigation; (iv) Android-based water delivery control systems for irrigation; (v) hydroponics for vegetable and herb production (needs to be demonstrated in all regions with private sector support), and (vi) spring-shed management systems.

20. Further investments should be demonstrated and up-scaled in **technologies to extend growing seasons for crops** to adjust the time of planting, time of harvesting, combat irregular temperature changes (frosts, cold spells, extended snow days), e.g., heated greenhouses, poly-tunnels, cold frame technologies, covered raised beds, and use of new cultivars and varieties. Greenhouse fabrication, repair, and accessories services have good potential, and portable greenhouses using local materials such as bamboo and recycled pipes need to be explored further with potential investors. Poly-tunnels and greenhouses can also be used for drying crops after harvesting – solar driers can also be part of the business mix.

21. **The RGoB will require investment in green finance and innovation** as part of the Vision 2040 Strategy through the efforts of MoAF, DLG, MoEA, and Dzongkhags with the support of GNHC and MoF. The focus should be on the following areas:

    (i) Developing a *Green Taxonomy* to define which economic activities should be promoted to tackle environmental degradation and climate change and to assist investors in ensuring that no economically viable activities are missed out. Please see Volumes 2 and 3 of this Report for an inventory of green and climate-smart technologies considered in this study.

    (ii) These all need to be expanded by MoAF going forwards as new ideas and technologies are developed and out-scaled across Bhutan's communities.

    (iii) A *Green Jobs Task Force* to be established through a partnership with business, state-owned enterprises, skills providers to help promote green jobs;

(iv) a *Green and Climate Change Technology Innovation Investment Portfolio* to be created to provide investments in green and climate-smart technologies;

(v) Reviews are required of tax incentives, regulations, and other leveraging mechanisms that government can adopt to promote investment in green and climate-smart technology business.

4.4. Capacity-building

22. **Strengthening the capacity at the Ministry of Agriculture and Forests** is required for Bhutan to take forward Green Businesses and Climate Smart Technology Businesses in the private sector with an RNR sector, farmer, or rural development focus. MoAF needs to provide research and design assistance, technical support for implementation, and investment facilitation.
23. **Strengthening the capacity of the Department of Local Government** is needed for promoting viable technologies that have been successfully piloted and in enabling DLG to facilitate access to training, financing, service delivery for community-based industries (CBI), interested new private entrepreneurs (e.g., unemployed educated youth), existing interested private businesses, and relevant state-owned enterprises (SOE). **DLG should encourage the demonstration and up-scaling of successfully piloted GB and CSTs in interested Dzongkhags through inclusion in Local Economic Development (LED) plans and the Dzongkhag "economic" and "environment" grant portfolios**.
24. **Strengthening the capacity of entrepreneurs and businesses**, especially regarding up-scaling already proven green and climate-smart technologies in Bhutan. Where technologies are still at the piloting and demonstration stage, SMEs should be encouraged to be part of this by providing grants or matching grants with strong technical support and training.

4.5. Create Awareness

25. During this study, various stakeholders (from farmers, villagers, extension workers, and local officials) expressed that they did not understand what a green business is, nor what constitutes a climate-smart technology business. Therefore, it is recommended that DLG and Dzongkhags carry out an **awareness-raising campaign regarding green and climate-smart technology investment opportunities**. The focus should be on three groups:

    [I] the **potential businesses and entrepreneurs** (e.g., existing private sector businesses, unemployed educated youth, women's groups, other likely entrepreneur groups);

    [II] the **potential beneficiaries of the businesses** (farmers, rural and urban households, other potential recipients of the goods and services provided by the GB and CSTB); and

    [III] government officials at the local level who need to become more familiar with developing ***"Circular Economy, Green and Climate Smart Technology Investment Plan."***
26. It is recommended, based on the potential GB and CSTB (defined in some detail in Volume 2 and Volume 3 of this Report to a pre-feasibility level), that DLG organize a **training/awareness course for unemployed educated youth, women's groups, Dzongkhag planners, existing private businesses, state-owned enterprises, and cooperatives**. The participants shall be chosen based on their expressed interest in being involved in GB and CSTB investment opportunities in the future. The main outputs from this training will be: (i) the level of interest amongst the trainees before and after the training; (ii) the types of business for which there is a strong interest and "more slight interest"; (iii) identification of entrepreneurs where there is a perceived strong potential for adoption of particular businesses. The training may also identify new activities that this research study has not considered so far.
27. It is recommended that a ***Green and Climate Smart Community Competition*** be held annually for all Gewogs and Chiwogs in each Dzongkhag to evaluate the adoption of a wide range of innovative green and climate-smart technologies, including product and service delivery businesses. This could be carried out at the Dzongkhag level and then at the National level. It is suggested that DLG organize this activity as part of an awareness campaign with prizes for the winners.

4.6. Action Plan

A recommended action plan framework has been developed to follow this study. The action plan identifies critical recommendations with activities needed to achieve these recommendations.

The lead agencies and involved stakeholders are also listed. Since the lead agencies are multi-agencies, it is suggested that the Policy and Planning Division be responsible for finalizing future green and climate-smart technology action plans for the MoAF in conjunction with DLG and the 20 Dzongkhag administrations.

It is **essential to be aware that this Action Plan complements the strategies and action framework included in the Report *"Study on Circular Economies and Waste Recycling for RNR sector in Bhutan,"*** which was the output of Activity A2.12 of the EU-TACS program. These two Action Plans must be used in a synchronized manner.

Readers should bear in mind that the suggested Action Plan included below in this volume (Volume 1 - Main Report), and for Volume A2.7B covering Green Business Opportunities, have their **Focal Areas established at the micro-level, of promoting opportunities for green businesses, waste management, SME development, youth employment generation, DLG/Dzongkhag support**.

The Action Plan for A2.12 has a very different set of Focal Areas, established at the **macro-level, providing strategies and action plans for the three main RNR sectors, proposing RNR departmental support, and developing a vision for Bhutan's circular economy, and for the nation's green waste management**.

These two Action Plans should be read in tandem to gain maximum knowledge for future programming on all types of green investment. The authors advise that DLG requested the Study for A2.7 **to support business opportunity awareness and training at the local level**.

In contrast, the Study for **A2.12 was designed to support MoAF with its RNR vision 2040 strategy and future programs**.

Stakeholders such as MoAF, DLG, DoA, DoL, and the Department of Forest and Park Services, should remain focused upon their relevant roles in both planning frameworks for the work that MoAF and all other partners are now together facing.

#	Recommendations	Activities	To be led by	Stakeholders involved
A: DEVELOPMENT OF PLANS & FRAMEWORKS / STRENGTHENING POLICY & REGULATORY ENVIRONMENT				
1	Steered by the Working Group, design and adopt a **'Green Businesses, RNR Waste Recycling, Circular Economy and Climate-Smart Technologies Industrial Investment Plan'** to cover the period up to 2040	• Form a Working Group with stakeholder representatives to examine the integration of the all Green Waste, Climate-Smart and other similar technologies that have been prioritized in Volume 2, Volume 3 of this Report, as well as those proposed within the Report on Circular Economies. • Examine the options for integrating circular economy into existing and emerging waste management, climate-smart policies, programs and regulations. • Further, continue to assess the current status of Circular Economy and green waste and climate-smart technologies. • Develop a road map with dates and benchmarks, including resource needs. • Construct a document that provides realistic plans, sets targets and explains the methods for achieving these.	DLG with MoAF, DoL, DoFPS and other RNR agencies	Dzongkhags, MoAF units involved in RNR sector activities, research centers
2	**Enhance the institutional framework for advancing green waste and climate-smart technology investment** through a range of stakeholders.	• Developing a multi-agency policy framework • Conduct stakeholder consultations to examine the opportunities presented in this Report in its three sections (Volume 1, Volume 2 and Volume 3); and the Report "Study on Circular Economies and Waste Recycling for RNR sector in Bhutan" was the output of EU-TACs Activity A2.12. • Develop strategies to provide initial directions for Actions by each stakeholder and for collaborations between stakeholders. • Revise policies or regulations on waste management with Circular Economy principles or develop separate regulations from MoAF. • Develop draft documents that describe the processes and procedures (from identification, design, feasibility, business plans, service delivery) that finally lead to supporting the actual start-up and financing of Green Waste/Circular Economy businesses. • Develop logical frameworks and other planning instruments, especially those that hold indicators for monitoring, targets, evaluation-level indicators. These must describe how information from M&E systems can be derived to inform multi-stakeholder learning.	DLG, MoAF (RNR Sector) MoEA, DRE	DLG, Dept. Of Livestock, Dept. Of Agriculture, Dept. of Forest and Park Services, and the regional research agricultural centers
3	**Develop a planning and support process for Dzongkhags and Gewogs to identify potential green and climate-smart businesses** and for assist entrepreneurs	• Define how collaboration between MoAF, DLG, other institutions, and Dzongkhag administrations can target the most significant Circular Economy opportunities that most rapidly and efficiently generate substantial jobs and create employment.	DLG	D DLG, MoAF

#	Recommendations	Activities	To be led by	Stakeholders involved
4	**A multi-agency framework for 'enhancing accessibility to Green Business Models, Recyling Climate-Smart Technology services, and other Circular Economy and start-up industrial facilities'** be developed for start-up private SMEs, start-up CBI, and existing adopter businesses.	• Development of a multi-agency framework • Provide accessibility support for entrepreneurs to prepare their business plans • Accessibility support to finance, equipment, and machinery suppliers, training and skills, technical assistance, branding and marketing of products and services, etc.	PPD, MoAF. DLG	DLG, Dzongkhags, concerned Sectors of MOAF
5	**Governance and Institutionalisation of the organizational setting and procedures for fostering the Circular Economy**	• Review of governance opportunities and limitations for high-level steerage of progress towards an increasingly Circular Economy • Constitution of Circular Economy Working Group and/or an RNR Waste Recycling Working Group • Develop terms of reference for the functions and roles of the RNR waste recycling and/or Circular Economy Working Group • Conduct meetings as and when required to discuss RNR waste recycling and the Circular Economy	DLG, MoAF, MOEA, DoA, DoL and others	Dzongkhags
B: CAPACITY BUILDING OF LEAD STAKEHOLDERS				
6	**Strengthen the capacity of MoAF/DoL/DoA for Bhutan to take forward Green Businesses** and Climate Smart Technology Businesses in the private sector where there is an RNR sector, farmer, or rural development focus.	• Identification of relevant officials for the training, including strengthening the Investment Facilitation Section at PPD. • Draft functions of the division or section to look after the Circular Economy functions under MOAF • Establish the division or section within the MOAF for Circular Economy functions • Develop circular economy and RNR waste recycling guidelines and manuals • Conduct training of trainers on Circular Economy principles and practices, green business opportunities, and CSTs	PPD	MOAF, RNR research centers and the sectors, Dzongkhags

#	Recommendations	Activities	To be led by	Stakeholders involved
7	**Strengthening the capacity of the Department of Local Government, The Ministry of Economic Affairs/Departemnt of Renewable Energy, and other Departments and units to promote viable Circular Economy, green waste technologies, and CSTs**	• Identify and profile all Green Waste, CST and other Circular Economy models that have been successfully piloted. Prepare Instruction Manuals and training materials directed at Entrepreneurs and other participant stakeholders. • Ensure a wide range of collaborative support that enables DLG, MoAF and MoEA to provide training, access and enable financing, and support business service delivery for community-based Industries (CBI), interested new private entrepreneurs (e.g., unemployed educated youth), private businesses, and relevant state-owned enterprises (SOE). • Identify relevant officials for the training • Conduct training on green business and CSTs • The trainers will train people in the Dzongkhags for various other establishments	DLG	MOAF, RNR research centers, and the sectors, Dzongkhags
8	**Promote innovative finance and incentives**	• Effective implementation of Circular Economy interventions depends on sufficient financial resources and their availability over successive time frames • Addressing the complex processes and requirements of the available facilities will be a challenge • MoAF and MoEA must develop an extremely-capable cadre of development finance specialists. • MoAF, DLG and MoEA, will need to be innovative and capable of rapid reactions, in order to successfully apply for finance the large volume of potential Circular Economy projects that may be planned	DLG, MoAF, MoEA	
C: ESTABLISH INSTITUTIONAL LINKAGES				
9	**Provide financial incentives, and business development services support for agents of all types interested in investing in RNR recycling or circular economy**	• Darry out dialogues with financial institutions and organizations providing finance assistance to the Circular Economy. • Support entrepreneurs and collaborating institutions to establish MOUs with organizations providing finance. • Government should provide some kind of fiscal incentives and tax exemptions for both the business and the purchase of RNR waste recycling equipment. • Establish linkages with international agencies to provide financial and technical support • Consult the Ministry of Finance (MoF) for how fiscal incentives, tax exemptions and support for the RNR recycling or circular economy projects can be clearly aligned with existing rules and regulations for fiscal incentives, as well as tax systems. If additional fiscal incentives or tax amendments are required within existing regulations, consult with the MoF and make the changes. • After the approval of the fiscal incentives and tax exemptions, conduct awareness among the stakeholders	MoEA, DLG	MoF, MoAF

#	Recommendations	Activities	To be led by	Stakeholders involved
10	**Foster Public-Private Partnership Models, and support the networking of numerous stakeholders and agencies to work together in the operation, management and collection of waste, implement CSTs and foster other Green Business Models**	• PPP guidelines and policies should be updated to ensure no limitations would prevent the application of PPPs to the range of Circular Economy investments • Private entrepreneurs can be encouraged to participate in collaborative PPP models for Circular Economy facilities. • Build networks amongst various agencies in terms of waste collection, management, and assistance	MoAF	D
11	**Establish a Monitoring, Evaluation and Learning framework for future versions of this collaborative Action Plan**	• Conduct bi-annual progress review meetings on the progress of RNR recycling or circular economy activities • Submit progress reports annually to the relevant authorities • Conduct coordination meetings with relevant stakeholders like Thromdee, Dzongkhag Municipality and private entrepreneurs involved in the waste management activities	All lead stakeholders	
D: START-UP PROCESS				
12	Targeted entrepreneurs should initially be focused on existing entities	• Collect details of potentially interested business establishments such as private businesses, state-owned enterprises, educated and unemployed youth, women's groups, community-based organizations, small industries, cooperatives • Assess existing businesses and select appropriate companies for start-up	Dzongkhags and MoAF	DLG and Dzongkhags
13	**Dzongkhags to kick start Green Business and CSTs through their Local Economic Development Plans** and the LG "economy" and "environment" grants	• Training of Dzongkhag planners and critical officials • Include action plans in their economic development plans	Dzongkhags	DLG, Dzongkhags
14	**Skills development and technology by developing the capacity of individuals and institutions**	• Carry out training and workshops on basic technologies available in RNR recycling or circular economy opportunities. • Conduct detailed RNR recycling or circular economy technology applications on selected models. • Capacity-building partnerships must be targeted and directed at building the capacities and delivering programs, of RNR sector officials, as well as the capabilities of private entrepreneurs. • See the Report of Activity A2.12 of EU-TACS that provides a detailed list of training topics. • Conduct training on market value chain, supply chain and marketing on RNR recycled products	MoAF, DLG	

#	Recommendations	Activities	To be led by	Stakeholders involved
E: AREAS OF INVESTMENT AND UP-SCALING				
15	Feasibility studies are prepared for potential and viable GB and CSTB	• MoAF and DLG can jointly select enterprises with higher potential for success • Guidelines for preparing feasibility studies should be prepared by the PPD, MoAF with assistance from local consultants	PPD, MOAF	DLG, PPD, MOAF, RNR sectors
16	**RGoB should pursue a large number of significant international partnerships and obtain technical assistance, which can help in providing a substantial volume of funds and support for capacity development programs and implementation of specific technologies**	• Systems of partnerships must be targeted and directed at building the capacities and delivering programs, of RNR sector officials, as well as the capabilities of private entrepreneurs in all aspects of Circular Economy policies and practices • Finance must be solicited from a wide range of multi-lateral and bilateral financing mechanisms to build programs that implement the diseemination of Circular Economy models, climate-smart technologies and waste recycling.	Dzongkhags	
17	Support to **implementing the sustainable green and CST business plans will need to be provided at the local levels**	• Identification of private SME/CBI/existing businesses. • Dzongkhag planners shall monitor and coordinate any new GB and CSTB developments within their control area. • Dzongkhags to ensure that GB and CSTB are included in their Local Economic Development (LED) plan targets after consultation with relevant local stakeholders.	Dzongkhags	Dzongkhags and RNR sectors
18	**Obtain Expressions of Interest for RNR recycling or Circular Economy projects and support the implementation of approved projects**	• Invite expression of interest from private investors for RNR recycling or circular economy projects. • Screen out the projects as per the screening guideline prepared by MOAF. • Approval of RNR recycling or circular economy projects. • Provide facilitation services. Facilitate access to finance to potential investors for the approved project on RNR recycling or circular economy proposal. • Provide support in terms of coordination with relevant agencies to obtain necessary clearances • After approval of proposals, provide technical assistance or linkage to specialised agencies, with entrepreneurs, to support the construction of facilities and the procurement of required machinery.	DLG, MoAF, MoEA	

#	Recommendations	Activities	To be led by	Stakeholders involved
19	**Investment in recycling wood-based waste (sawdust, wood shavings, wood chips for bio-fuel briquettes)** is a high priority.	• This opportunity is included in Volume 2 that reviewed bio-fertilizer, bio-manure, or vermi-composting from organic waste of the green Waste Study where it is examined in detail. • Coordinate with NRDCL and Dept of Forest for identification of wood-based waste and its usage. • Prioritization of wood-based waste industries for implementation. • Conduct technical and socio-economic research on the prototypes and initial ideas for feedstocks available for a composting facility. These could include biomass waste such as invasive plants (Eupatorium, Lantana, Mikania), pine cones/needles, herb processing waste, fallow land conversion, waste from electric fence line weeding maintenance, and waste biomass cut from under high tension electricity lines. • Enable all actors to work coherently together to increase the production of fertilizer or composting from agriculture.	MoAF, DLG	MoAF with Dept of forest and RNR research centers, Dzongkhag
20	**Investment in recycling waste paper and cardboard can be promoted through a network of collectors, as profiled in Volume 2 of the Green Waste Report.**	• Identification of paper waste collection areas in different Dzongkhags • Prioritizations of paper waste recycled products for other areas. • Investment and implementation of paper waste recycled products. Detailed Technical and Scio-economic Assessments will be needed for options. • Egg tray manufacture for poultry farmers • Pencil making (import substitution benefit), • Shopping bag manufacture (divesting businesses from using plastic bags).	DLG	MoAF with Dzongkhag
21	**Investment in recycling plastic waste can be promoted through a network of collectors** (soft plastic, PET bottles, hard plastics).	• Identification of plastic waste collection areas in different Dzongkhags • Prioritize different recycling actions Bitumen for rural and farm roads, plastic farm fencing poles, HDPE pipes, plant pots for nurseries from used PET bottles, then implement.	DLG	MoAF with Dzongkhag
22	**Up-scaling of investment is recommended in tree planting and conversion of over-mature and diseased orchards** (for farm forests, agroforestry, community amenity forests, conservation purposes) to be carried out by the establishment of private nurseries, tree surgeon services, invasive/unwanted biomass removal businesses	• Identification of plants for tree plantation along with the conversion of over matured or diseased orchards to private plant nurseries • Prioritize different areas for tree plantation and fruit and nut orchard management.	DLG and Dzongkhag	DLG, MoAF with Dzongkhag

#	Recommendations	Activities	To be led by	Stakeholders involved
23	**Up-scaling in investment for well-demonstrated renewable energy sources** occur at rural household, village, Gewog and Dzongkhag levels, e.g., biogas, solar, wind, and mini-hydro systems. These are especially suitable in off-grid areas and for standalone small industrial units.	• Coordinate with Department of renewable energy to identify renewable energy sources in Dzongkhags and gewogs • • Make plans for investment for selected renewable energy sources.	DLG, MoEA	DLG, MOAF, DRE and Dzongkhags
24	**Up-scaling and privatization of investment in products from and services for by-products from stall feeding of livestock,** e.g., excess slurry for Farm Yard Manure, biogas manufacture for cooking, lighting and heating, and equipment and materials services for biogas systems.	• Identification of biogas possible areas • Draw upon detail contained in Report of Circular Economies, which provide substantial technical guidance. • Investment for biogas plant through private and government combined model (PPP) • Provide support for materials and equipment.	DoL, MoEA, DLG and Dzongkhag	DLG, MoAF with Dzongkhag
25	**Investment in clean energy technologies should be piloted, demonstrated or up-scaled for home appliances, farm equipment and farm machinery**	• The piloting of clean energy technologies that use either direct mains electricity or rechargeable batteries (sourced from HEP or renewable energy sources). • Demonstration of clean energy technologies. • Up-scaling of those clean energy technologies.	DLG	DLG, MOAF, DRE, Dzongkhags
26	**Investment in water-efficient technologies, covering demonstration and up-scaling** from extraction to use	• Coordinate with MoAF for identification of water-efficient technologies • Demonstration of water-efficient technologies to combat depleting water sources caused by climate change (drought, drying springs, reduced river flow, irregular monsoon seasons) should take place through demonstration or up-scaling • Demonstration of water delivery systems, e.g., hydraulic pumps • Up-scaling if found successful.	MoAF, DLG	MoAF with RNR research centers and the Dzongkhag
27	**Investments in climate & temperature control technologies**	• Coordinate with MoAF for identification of technologies to extend growing seasons that can be demonstrated and out-scaled • Demonstration of technologies to extend growing seasons for crops, to adjust time of planting, to adjust time of harvesting, to combat irregular temperature changes • Up-scaling if found successful.	MoAF, DLG	MoAF with RNR research centers and the Dzongkhag

#	Recommendations	Activities	To be led by	Stakeholders involved
28	**Investment (out-scaling) in technologies to reduce human-wildlife conflict**	• Coordinate with MoAF for identification of technologies for human-wildlife conflict • Demonstration of technologies in farming areas with a high percentage of crop and livestock losses, e.g., electric fencing (mains or solar operated), net fencing, live fencing, off-farm conservation feed systems for wildlife. • Provide support for equipment and materials, maintenance contracts, and turn-key installations.	MoAF, DLG	MoAF with RNR research centers and the Dzongkhag
29	As so many sectors and institutions are involved, the **RGoB will require coherent and substantial investment in green finance and innovation** through the efforts of MoAF, DLG, and Dzongkhags with the support of GNHC and MoF/MoEA	• Develop a Green Taxonomy based upon the findings of EU-TACs A2.12 and A2.7 Reports to define which economic activities should be promoted to tackle environmental degradation and climate change and to assist investors • Green Jobs Task Force is to be established through a partnership with businesses, state-owned enterprises, skills providers to help promote green jobs • Green and Climate Change Technology Innovation Investment Portfolio to be created to provide investments in green and climate-smart technologies • Review of tax incentives, regulations, and other leveraging mechanisms that government can adopt to promote investment in the green and climate-smart technology business.	MoAF, MoEA, MoF, DLG	DLG, GNHC, MOF, RNR research centers, and the Dzongkhags
F: CREATING AWARENESS				
30	**DLG and Dzongkhags carry out an awareness campaign regarding green and climate-smart technology investment opportunities.**	• Identification of various relevant groups for the creation of awareness on green business and CSTs. • Conduct awareness program through the involvement of expertise of other officials from MOAF.	DLG	MoAF, RNR research centers, and the sectors, Dzongkhags
31	**DLG organizes a training/awareness course for unemployed educated youth, women's groups, Dzongkhag planners, existing private businesses, state-owned enterprises, and cooperatives.**	• Selection of various members from each of the different groups for training or awareness course. • Conduct training or awareness courses for different groups.	DLG	MoAF, RNR research centers, and the sectors, Dzongkhags
32	***Green and Climate Smart Community Competition* are held annually for all Gewogs and Chiwogs in each Dzongkhag** to evaluate adopting a wide range of innovative green and climate-smart technologies, including product and service delivery businesses.	• Develop concept notes for the green and CST competitions. • Circulate letters to all Dzongkhags on the theme of the competitions annually. • Allow participants to submit their proposals. • Selection of best performers with prizes and certificates.	DLG	MoAF, RNR research centers, and the sectors, Dzongkhags

The EU Technical Assistance Complementary Support Project (EU-TACS) has the aim of contributing to the sound implementation of the EU-Bhutan bilateral development cooperation strategy. Starting in March 2019, since then the EU-TACS project has provided technical assistance that has been focussed on Rural Development and Climate Change Response, and upon Local Government and Fiscal Decentralisation. As well, EU-TACS has supported the implementation of two EU Sector Reform Budget Support Contracts for the MoAF and for the DLG. The assistance has included consulting services, studies and communication aspects, in order to provide stakeholders with direction for capacity-building, dialogue, and policy change, in several key development themes and subject areas. EU-TACS will be completed by June 2022.

EU Technical Assistance Complementary Support Project – Bhutan.
Service Contract N° ACA/2019/404-700

Project
implemented by

DAI
Shaping a more livable world.