The Middle Path

NATIONAL ENVIRONMENT STRATEGY 2020

National Environment Commission
Royal Government of Bhutan

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This document has been prepared by the National Environment Commission.

National Environment Commission Secretariat

Royal Government of Bhutan

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"We must always be One nation with One vision in our convictions and efforts. When we hand over our country to our children, we should not only hand over a secure and sovereign country but an environmentally rich country."

His Majesty The King

"Bhutan must follow the middle path development, that is development that recognizes the need to develop our economy, to progress technically, medically and scientifically while still maintaining our rich cultural heritage and our traditional values, as well as preserving our natural resource base.

Throughout the centuries, the Bhutanese have treasured their natural environment and have looked upon it as the source of all life. This traditional reverence for nature has delivered us into the twentieth century with our environment still richly intact. We wish to continue living in harmony with nature and to pass on the rich heritage to our future generations"

His Majesty, The 4th King Jigme Singye Wangchuck

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LINGKANA PALACE
THIMPHU, BHUTAN

Bhutan is blessed with a precious inheritance in our pristine environment. Over the ages, this gift has been well preserved through the profound environmental vision and the wise stewardship of our successive monarchs. Sound environmental policies and aws have ensured the sustainable management of our forests, waters, flora and fauna.

We have come a long way since the adoption of the Paro Resolution on Environment and Sustainable Development in May 1990. This resolution established upon Royal Command of His Majesty the Fourth Druk Gyalpo, King Jigme Singye Wangchuck, incidentally, preceded the Rio Earth Summit of June 1992. It was a milestone in ensuring the sustained use of natural reources in consideration of Bhutan's environmental conservation policy. Following this, the National Environment Strategy of 1998 put emphasis on a middle path approach to development – finding a balance between economic development and preservation of our natural resource base, our rich cultural heritage and traditional values.

While environmental conservation has been at the heart of Bhutan's development journey, the rapid pace of economic development has put extreme pressure on our environment and the ecosystem. Looking back over the past two decades, since the first environment strategy, we have successfully traversed an environmental conservation path carefully shaped and guided by our visionary monarchs. We have managed to pursue a unique development-oriented strategy in which natural resources are not just seen as development assets to be exploited, but more importantly, as a precious gift whose careful and wise preservation can contribute meaningfully to the process of sustainable social and economic development.

I am happy to note that this revised National Environment Strategy 2020, will continue to further build on our collective efforts to address new challenges in fulfilling the constitutional mandate to 'secure ecologically balanced sustainable development, while promoting justifiable economic and social development'. I am particularly pleased that the document addresses, among other challenges, key concerns such as waste management, climate change, protection of air and water quality and effective environmental services delivery.

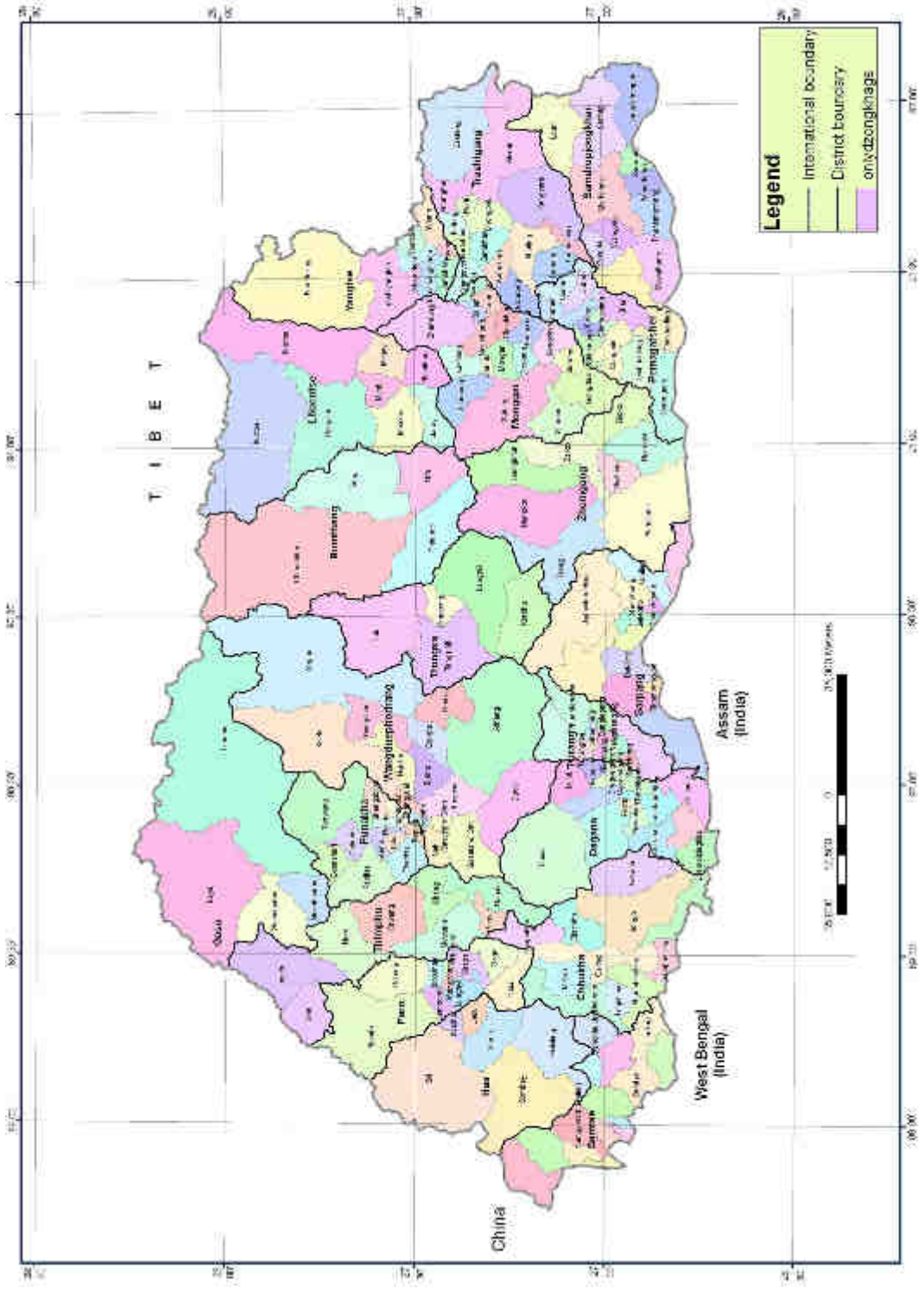
As Bhutan continues to progress under the wise guidance and exemplary leadership of His Majesty The Fifth Druk Gyalpo, King Jigme Khesar Namgyel Wangchuck, it is the duty of all Bhutanese citizens to uphold our sacred responsibility and commitment to protect and conserve our environment and embark on a path of conscientious development that is sustainable.

As custodians of the environment for the next generation, Bhutan must be at the forefront of the commitment to ensure a more sustainable future. As we pave our way into the next century, I urge all individuals, communities and organisations to work together to continue your support, commitment and efforts towards the preservation and enhancement of our natural heritage.

Jetsun Pema Wangchuck

(Her Majesty The Gyaltsuen, Jetsun Pema Wangchuck)

MAP OF BHUTAN



“It is better to have milk and
cheese many times,
than beef just once.”

– traditional Bhutanese proverb –

INTRODUCTION

This document is aligned with all of the relevant environmental policy, legislation and regulations existing in Bhutan, integrated into a new National Environment Strategy (NES) 2020-2030. The new Strategy balances conservation with development, and enhances implementation and operationalization of the existing legislation in all spheres of government, down to the local level. The Strategy is intended to guide implementation of the relevant policy and legislation in an integrated and strategic fashion, through articulating a set of Strategic Objectives. This introduction sets out the Vision and Mission for the New National Environment Strategy, and provides a short introduction summarizing the developments in Bhutan and globally since the time of the 1998 Strategy, and presenting the context, rational and mandate for the new National Environment Strategy. Chapter 1, which follows, sets out the overarching policy framework and international commitments in more detail.

Vision

The vision of this New Environment Strategy is, "A healthy and sustainable environment for present and future generations in pursuit of Gross National Happiness", in line with the vision of the National Environment Commission, and *Bhutan 2020: A Vision for Peace, Prosperity and Happiness*.

Mission

To conserve and protect environment through the National Environment Commission as an independent apex body on all matters relating to environment to regulate environmental impacts and promote sustainable environment.

Background to the new Strategy

The precursor to this New National Environment Strategy, the 1998 document *The Middle Path*, was crafted at the dawn of the 21st century when, after centuries of self-imposed isolation, the Kingdom of Bhutan emerged into the 20th century with an extensive forest cover and a largely intact natural resource base. Aware of the problems that uncontrolled economic progress can cause, the Royal Government of Bhutan has chosen the "middle path" of sustainable development, in order to raise the living standards of the present population without compromising the country's cultural integrity, historical heritage or the quality of life for future generations. Sustainable development is particularly important for a country like Bhutan, with its fragile mountain ecosystems, susceptible to the impacts of a changing climate, and high level of biodiversity.

Since the first NES, the milieu for environmental conservation in Bhutan has evolved significantly. Environment is increasingly seen and approached as an issue that cuts across a wide range of development sectors. Concomitantly, the institutional purview of environmental management has expanded beyond the traditional domains of a few agencies. Many new policies and legislations have come into being during this period to address emerging environmental issues, including those relating to changing consumption patterns and waste, and the impact of climate change in intensifying natural disasters.

Through Royal decree and guidance, the political system has changed from absolute monarchy to constitutional monarchy in 2008, ushering in democratic governance. The central government is run by a cabinet of ministers chosen from elected parliamentarians and the local governments are run by community leaders elected by the local constituencies.

The population has grown at 3.1 percent per annum in the 1990s, slowing to 1.8 percent per annum in the recent years[1]. The demographic landscape has changed significantly as a result of migration from rural to urban areas and from eastern to western region. Urbanization is taking place at a rapid pace – Bhutan's urban population increased from 30.9% to 37.8 % of the population between 2005 and 2017[2]. Thimphu, the capital city and the largest urban centre, is home to nearly half of the country's urban population and is experiencing new challenges associated with rapid growth in vehicular traffic and consumption of packaged products.

Over the recent years, Bhutan has become an increasingly active partner in international and regional efforts of environmentally sustainable development. It is a party to all the United Nations Conventions that emanated at the United Nations Conference on Environment and Development (UNCED) 1992, namely the Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), and United Nations Convention to Combat Desertification (UNCCD). In addition, it is a party to many other international environmental treaties and constituent instruments (see below). This includes the 10-Year Framework of Programmes on Sustainable Consumption and Production, whose inter-governmental board is composed of 10 countries including Bhutan. Bhutan has also localized the 2030 Agenda for Sustainable Development and is advancing progress on the Sustainable Development Goals (SDGs) as part of its pursuit of Gross National Happiness.

As shown in the *12th Five Year Plan, 2018-2023*, Bhutan has managed to bring down incidence of both income and multi-dimensional poverty as a result of broad-based and targeted poverty reduction programmes and policies implemented over successive plans. The national poverty rate has been reduced from 23.2% in 2007 to 8.2% in 2017. In the same period, rural poverty was brought down to 11.9% from 30.9 %, and the proportion of urban poor was reduced from 2% to 0.7%. Incidence of subsistence poverty or extreme poverty stood at just 1.5% in 2017[3]. These achievements mean that Bhutan has nearly ended extreme poverty within the living memory of a generation.

Despite multiple development challenges, Bhutan has made steady progress in graduating from Least Developed Country (LDC) status, already meeting two of the three criteria (GNI per capita and the Human Asset Index) and is due to graduate in 2023. The Economic Vulnerability Index (EVI) reflects ongoing challenges around dependence on a single dominant export, in the form of hydropower, and slow progress in diversifying the economy and broadening the tax revenue base, making the country vulnerable to economic shocks. Pressures for industrial growth to sustain development gains and meet the needs of a growing urban population have increased substantially over the past two decades, with associated challenges of air and water pollution, land degradation, and waste generation, and a need for stringent development controls.

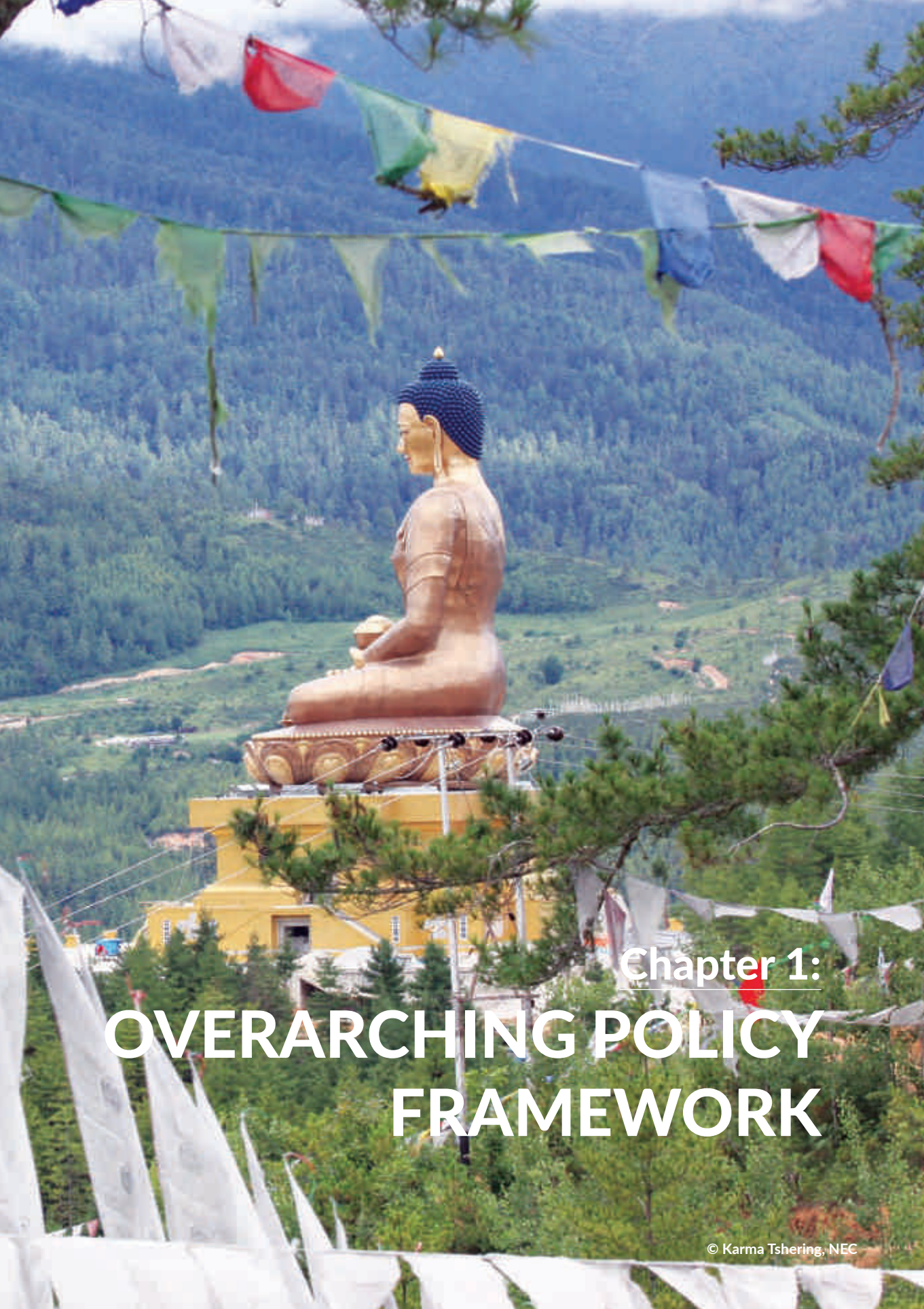
Rapid demographic changes and urbanization are placing both direct and indirect pressures

[1]Population and Housing Census Bureau, 2017
[2]PHCB, 2017

on natural resources. Large tracts of forest areas are either lost to fires or cleared in pursuing socio-economic development through roads, infrastructures, mining and quarrying. Developmental activities not only lead to loss of forest areas, but they also trigger habitat fragmentation and degradation, impacting negatively on biodiversity and often aggravating human-wildlife conflicts. Bhutan is part of the Eastern Himalayan region—an area where the impacts of climate change are often more severe than anywhere else in the world. The region's glaciers have been melting at alarming rates and experiencing increasingly intense rainstorms that activate damaging floods and landslides.

In the new millennium, the concept of sustainable development has been increasingly absorbed by the GNH architecture, which has been elaborated further and embedded in institutions and administrative bodies throughout Bhutan (see "Conceptual design and goals" and "Implementation process"). In parallel, the NES has continued to guide economic activity that has an environmental impact. While Bhutan is recognised as a leader in sustainable development and environmental stewardship, management of co-benefits and trade-offs, along with balancing of conservation and development, continues to be a challenge.

[3]12th Five Year Plan, 2018-2023



Chapter 1:

OVERARCHING POLICY FRAMEWORK

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The overarching framework for this New National Environmental Strategy is provided by a number of key national policies, as well as global commitments in terms of Multilateral Environmental Agreements. The key overarching documents are outlined in this chapter, with specific policies, laws and regulations discussed in the chapters which follow.

The Constitution of the Kingdom of Bhutan, 2008

The Constitution requires the Government to secure ecologically balanced sustainable development, while promoting justifiable economic and social development, and ensure a safe and healthy environment. Article 5 of the Constitution defines the government's duty to maintain a minimum of 60% of forest cover for all time. Article 5 also vests the government, the parliament, and every Bhutanese citizen with the right and responsibility for environmental conservation and stipulates several provisions to ensure that development does not take place at the cost of the natural environment, which includes:

- Every Bhutanese is a trustee of the Kingdom's natural resources and environment for the benefit of the present and future generations and it is the fundamental duty of every citizen to contribute to the protection of the natural environment, conservation of the rich biodiversity and prevention of all forms of ecological degradation, through the adoption and support of environment friendly practices and policies.
- The Royal Government shall: protect, conserve and improve the pristine environment and safeguard the biodiversity of the country; prevent pollution and ecological degradation; secure ecologically balanced sustainable development; and ensure a safe and healthy environment.

Bhutan 2020: A Vision for Peace, Prosperity and Happiness

Published in 1999, *Bhutan 2020: A Vision for Peace, Prosperity and Happiness* confirmed Gross National Happiness as Bhutan's central development concept and clarified its goals as follows: "Gross National Happiness does not regard economic growth as being unimportant. On the contrary, it is an important means for achieving higher ends. The challenge is one of finding the balance between material and non-material dimensions of development". The document translates this vision into five objectives: human development; culture and heritage; balanced and equitable development; governance; and environmental conservation. Targets defined for each of these five objectives have been decisive in the development of subsequent five-year plans, including the *12th Five Year Plan, 2018-2023*.

The 2020 Vision for Our Environment reads as follows: "In 2020, 60 percent of our nation will still be forested and we will be unique among the community of nations for the proportion of our territory that we have freely chosen to set aside and designate as national parks, nature reserves and other protected areas. Our approach to environmental conservation will not be a static one. It will be given a dynamic and development-oriented interpretation in which natural resources are not only seen as something to be preserved but also as a development asset that can, with care and wisdom, contribute to the process of sustainable social and economic development. This interpretation will have been given to our rich biodiversity that, two decades hence, will have provided the basis for new economic activities that will not only provide an important source of export revenues and high quality employment but also place our nation in the vanguard of technological advances for the benefit of humankind. This

interpretation will have been accompanied by the full institutionalization of capacities to undertake systematic and detailed assessments of the environmental and social impacts of development projects. Such assessments will have become a routine and indispensable part of decision-making on development, not only at the national but at the Dzongkhag and Gewog levels also. Two decades from now, yak herders will still form part of our population. We will take pride in such occupations, representing as they do a tangible example of the unique relationships that have evolved between people and nature in our Himalayan Kingdom as well as of the wisdom accumulated over centuries concerning the sustainability of human activities in a fragile and often inhospitable environment".

Gross National Happiness

Anchored by far-sighted leadership and stable political order, the country has pursued a development path that is based on the Bhutanese belief and premise that true development takes place when social, economic, spiritual and environmental well-being occur side by side to complement and reinforce each other. "Gross National Happiness" (GNH) is the term that has come to manifest this distinctive development philosophy, following His Majesty the Fourth King's famous statement of wisdom "Gross National Happiness is more important than Gross Domestic Product", first articulated in the 1970s.

Initially anchoring the Bhutan 2020 Vision, the concept of Gross National Happiness was further developed, and is now based on the following four pillars:

- *Equitable socio-economic development*
- *Conservation of the environment*
- *Preservation and promotion of culture*
- *Promotion of good governance*

The GNH development objective of environmental conservation and sustainability cannot be achieved in isolation. Recognizing this inter-linkage, the Royal Government of Bhutan has increasingly come to approach environmental conservation as a cross-cutting development theme with stress on mainstreaming environmental issues in various development plans and programs at central, sectoral and local levels. Policies are subject to a systematic review with regard to their impact on all sustainability issues and on human well-being.

In measuring progress towards Gross National Happiness, a GNH index is used, comprising nine domains as shown in the diagram which follows. These domains are further underpinned by 38 sub-indices, 33 indicators and 124 variables, which form the basis of the GNH social survey.

The Middle Path – National Environmental Strategy for Bhutan, 1998

Published in 1998 under the title "*The Middle Path – National Environmental Strategy for Bhutan*", the original NES placed Bhutan's development concept expressly in the context of sustainable development. The Middle Path document articulated the Bhutanese context and concept of sustainable development and identified three main economic avenues for such development:

- hydropower development based on integrated watershed management;
- agricultural development based on sustainable land management practices;
- and industrial development based on effective pollution control measures and environmental legislation.

The Middle Path also examined a number of areas of special importance for environmentally and culturally responsive economic development. These focus areas included tourism, roads, financing mechanisms for sustainable development, public health, urbanization, gender and natural resource management, environmental

impact assessments, and population. Finally, it outlined five key cross-sectoral needs that the country must effectively address to integrate environmental considerations into economic development planning and policymaking. These needs pertained to information systems and research, institutional development and popular participation, policies and legislation, training and education, and monitoring, evaluation and enforcement.

National Environment Protection Act, 2007

It establishes the role of the National Environment Commission (NEC) and other competent authorities, including those at the Dzongkhag level, as well as the Environmental Tribunal. As a cross-ministerial independent decision-making body, the NEC has a mandate to monitor ambient air and water quality and land use changes, with procedures for environmental inspections, verification, enforcement, and penalties, must

The nine domains of Gross National Happiness

operate an environmental information system and produce a regular status report on the environmental conditions in the country.

Principles in the NEPA include the fundamental right to a safe and healthy environment, intergenerational justice, the precautionary principle, a "Principle of 3Rs" (minimizing impact and reducing, reusing and recycling materials), the "polluter pays" principle, freedom of information and access to justice for any individual whose right to a safe and healthy environment has been affected or is likely to be affected. An array of financial instruments is foreseen by the NEPA, including fiscal incentives for environmental protection and compliance, tax incentives, reductions in customs and other duties for the importation of environmentally friendly and energy-efficient technologies; charging levies and fees for utilization of natural resources; and mechanisms for valuation of and compensation for natural resources.

Economic Development Policy, 2016

The *Economic Development Policy, 2016* is clear in its intent to ensure the growth and development of a green and sustainable economy. The vision of the policy is "A green and self-reliant economy sustained by a knowledge-based society guided by the philosophy of GNH".

The strategies outlined in the policy are informed by the need for environmental sustainability, and include imperatives to:

- Diversify the economic base with minimal ecological footprint;
- Harness and add value to natural resources in a sustainable manner;
- Promote Bhutan as an organic brand; and
- Reduce dependency on fossil fuel.

Five Year Planning cycle

Since 1961, Bhutan has followed a five-year planning cycle that articulates the socio-economic development priorities and programmes to

National Key Result Areas in the 12th Five Year Plan 2018-2023

be implemented over that period. Early plans focused on development of basic infrastructure aimed at reducing Bhutan's physical isolation and building transportation links and improving internal communications. With each successive Plan, the level of investment has increased. Along with it the development priorities have also evolved from building up basic infrastructure to investment in services, achieving economic self-reliance and has been accompanied by greater decentralization of powers and authorities.

The *12th Five Year Plan, 2018-2023* has identified 17 National Key Result Areas for development (shown above), emphasizing building economic resilience and productive capacity, and addressing last mile challenges to reduce poverty and inequality. At the same time, environmental sustainability is an important theme running throughout the Plan, including several environmental indicators, discussed in Chapters 2, 3, 4 and 5, and again in the Section on Conclusions and Monitoring Progress.

International commitments

Bhutan is committed to localizing and implementing the *2030 Agenda for Sustainable Development*, developed through the United Nations, with its Sustainable Development Goals (SDGs) taking forward a universal agenda of sustainable development over the period 2015 to 2030. The SDGs resonate strongly with the concept and principles of Gross National Happiness and reinforce the objective of environmentally sustainable development.

The Royal Government of Bhutan has prioritized three of the SDGs which can act as accelerators for implementation of the entire agenda – these are SDG 1 on Eradicating Poverty, SDG 13 on Climate Action, and SDG 15 on Life on Land. The *Twelfth Five Year Plan, 2018 – 2030* was seen as an opportunity to address national development goals within the framework of the 2030 Agenda, ensuring synergy between these agendas. The 17 National Key Result Areas in the Plan find close alignment with the SDGs, and assessments have revealed a high level of integration of the SDGs with Bhutan's national plans.

In 2009, Bhutan made a voluntary commitment to remain carbon neutral, building on the constitutional imperative to retain 60% forest cover in perpetuity, at the 15th Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC); and the commitment was reiterated in our first *Nationally Determined Contribution (NDC), 2015* towards the Paris Agreement. In addition to this high-profile commitment, which has drawn the attention of the world, Bhutan is a party to all the major multilateral environmental agreements, including the following:

- UN Convention on Biological Diversity (CBD), August 1995
- UN Framework Convention on Climate Change (UNFCCC), August 1995
- Convention for International Trade in Endangered Species (CITES), August 2002
- Vienna Convention for the Protection of the Ozone Layer, April 2004
- UN Convention to Combat Desertification (UNCCD), August 2003
- International Plant Protection Convention, June 1994
- UN Convention on the Law of Sea, December 1982
- RAMSAR Convention on Wetlands, January 2012
- South Asian Wildlife Enforcement Network (SAWEN), January 2010

In addition, the Royal Government of Bhutan has engaged in the 10-Year Framework of Programmes on Sustainable Consumption and Production, of which implementation is the first target of SDG12, as one of the ten members of its inter-governmental board, representing the whole Asian region, together with Japan.

Several government agencies are responsible for ensuring that Bhutan meets these international obligations, with some of the key ones shown in the table below:

Lead Agency	Multilateral Environment Agreements							
	UNFCCC	UNCBD	UNCCD	Ramsar	Vienna	Nagoya	Basel	Male'
NEC	+	+			+		+	+
MoAF			+	+				
NBC						+		
NSC			+					
MFA	+							
MoF					+			
MoLHR					+			

Cross-cutting principles

A number of cross-cutting principles inform Bhutan's architecture of policies, laws and regulations, and are discussed in relation to particular strategic objectives in Chapters 2 (Land), 3 (Air), 4 (Water) and 5 (Life). These cross-cutting principles include the following:

Cultural valuation and integration

In accordance with Gross National Happiness architecture, policies, and priorities, Bhutan continues to place a strong emphasis on maintaining tangible and intangible elements of living cultural heritage alongside environmental management strategies. This approach works to fully value and integrate diverse cultural perspectives to make implemented policies and best practices/solutions/tools of development culturally relevant to local communities.

Sustainable consumption and production

Bhutan is working with international partners to develop a national action plan on sustainable consumption and production, focusing on, Agriculture, Food, Construction, Tourism and Public administration sectors. This builds on the principle of sustainable production and consumption set out in the *Consumer Protection Act of Bhutan, 2012* to minimize environmental impacts (see Strategic Objectives 5, 6, 7, 8, 14 and 22). This allows for economic development that follows a resource-efficient approach and encourages a circular economy (see Chapter 2).

Low carbon development

Bhutan's policies for maintaining forest cover have enabled the country to become carbon negative (see Chapter 3) and are accompanied by a strategy for reducing greenhouse gas emissions from the construction, transport and industrial sectors. The approach of low-carbon development set out in the *National Strategy and Action Plan for Low Carbon Development, 2012*, which outlines options to manage emissions from energy-intensive industries, crop production, livestock raising, municipal solid

waste, road transport, and residential sectors, and is gradually becoming entrenched across the policy sphere.

Gender-responsive development

Accompanying rapid economic development, Bhutan has greatly reduced gaps in gender equality. The *Draft Gender Equality Policy, 2017* envisions a society where substantive equality is practiced providing equal opportunities for women and men to achieve their full potential and benefit equitably from the social, economic and political development in the country. The approach of gender-responsive development works to address gender equality and women's empowerment all spheres of development, including in implementation of environmental policies and programs.

Poverty and environment mainstreaming

With support from international partners, efforts have been made to address poverty reduction in environmental programs, and to bring environmental sustainability into social protection, job creation and other programs aimed at addressing poverty and inequality. This approach of programs mainstreaming poverty and environment is being integrated into government's planning and budgeting procedures, which translates to more green economy initiatives that promote sustainable development.


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Chapter 2:
LAND

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Bhutan is a landlocked country of 38,394 km^2 in the Eastern Himalayas, between China to the north and India to the south, east and west. Bhutan's stark variation in altitude, ranging from 100 metres above sea level to more than 7,000 metres, provides the country with high micro-climatic variation, a range of agro-ecological systems, and a wealth of biodiversity. Though agriculture remains the sector employing the highest percentage of population of the country (56.76%)[1], hydropower and tourism are the major revenue earners of the country. All of these sectors rely heavily on the natural resource base and on sustainable utilization of land. While Bhutan is committed to upholding the Constitutional requirement to keep a minimum of 60% of total land area under forest cover for all times, we must also make optimal use of land for socio-economic development purposes to maximize Gross National Happiness.

The environment in Bhutan is one of the most pristine in Asia – with clean air, water and primeval forest. However, with increasing rural to urban migration, growing population density in the towns and cities, rapid increases in imports of cars, and rising demand for fuel wood, roads and building construction, the future may see many negative effects on environmental assets. Bhutan is also highly vulnerable to the impacts of climate change, with prolonged dry winters already resulting in localized water shortages and exacerbated incidents of forest fires[2], unprecedented rainfall causing landslides and flash floods, glacial melting and resultant glacial lake outburst floods (GLOF), and the potential outbreak of new pests and diseases. All of these challenges call for an integrated approach to land use planning and sustainable land management that strives to meet multiple socio-economic and environmental goals, within the framework of the Constitution and guided by the four pillars of Gross National Happiness. This section explores a series of land-related challenges, to which the National Environment Strategy responds.

Challenges related to land use

Bhutan is a small country, with much of the terrain mountainous and unsuitable for development. The topographical conditions mean that 31% of agricultural land is located on steep slopes of 50% or more. There is competing pressure on land available in river valleys and less steep slopes from expanding infrastructure, urban development and agriculture. By 2018, forest cover accounted for 71% of Bhutan's total surface area[3] – well over the Constitutional requirement of a minimum of 60% forest cover. Currently under 3% of the total land area is utilized for agriculture[4], with pressure to increase this, since agriculture supports the food security and livelihoods of around 57%[5] of Bhutan's population, and generates around 17.4% of GDP[6].

With the fertility rate now at 1.7%, Bhutan's population of 735,553[7] is growing much more slowly than in the past, but the current population size, with advancing economic development, places pressure for conversion of both forests and arable land. The country's Gross Domestic Product per capita has been steadily increasing over the past two decades[8], with graduation to the status of a middle-income country due in 2023. Rural communities are seeing a trend of conversion of irrigated wetland (Chuzhing) to dryland (Kamzhing) agriculture, in some cases as a result of lack of irrigation water, and in other cases due to restrictions on long term investment in wetland[9], contributing to growing rice imports[10]. Other fertile land is under pressure from infrastructure development, including farm roads, electricity transmission/distribution lines, mines and quarries, industries and urbanization[11].

Between 2009 and 2015, a total of 2,739 ha of state land was leased out for agricultural, mining and industrial projects involving entrepreneurs and corporates[12]. This trend has continued, necessitating more systematic planning for allocation of limited land resources. With increasing development pressure there is also a need to ensure that the social and environmental impacts of planned developments are taken into

consideration, and negative impacts avoided or mitigated. Encroachment on state land through illegal conversion of forest to farmland, transfer of plots and development of settlements poses a challenge[13], along with the absence of a clear definition of encroachment or complete inventory of state land.

Challenges related to disaster impacts

Bhutan's location near the heart of the Himalayas means that its ecosystems are fragile, vulnerable to earthquakes, and to erosion along the steep mountain slopes descending rapidly into narrow river valleys[14]. These natural vulnerabilities are worsened in the context of climate change, with IPCC projections anticipating that Bhutan will experience an annual increase of rainfall by up to 500mm to 600mm, as well as a temperature increase of up to 3.5^{O}C by 2065[15]. While data are limited, an increase in the frequency and magnitude of extreme weather events has already been observed in recent years. Flash floods and landslides triggered by heavy rains, exacerbated incidents of forest fire due to prolonged spells of dry weather, and hailstorms and windstorms, have become more frequent and devastating, taking a huge toll on the economy as well as environmental resources[16].

Glacial lake outburst floods (GLOFs) are an increasing risk as glaciers melt, and localized changes in rainfall patterns are increasing droughts in some areas during the dry season. Bhutan saw a number of significant water-induced disasters in the last 25 years. Six major events stand out: the 1994 Lugye glacial lake outburst flood, the 2000 monsoon floods in Phuentsholing, the 2004 eastern Bhutan monsoon floods, the 2009 floods induced by Cyclone Aila, the 2015 Lemthang Lake outburst flood, and the 2016 southern Bhutan monsoon floods. For a least developed country like Bhutan with a small economy, population and land area, disasters of such proportion are very severe in terms of their direct and immediate impacts, as well as the potential negation of development progress accrued over many years.

Challenges related to land degradation

Because of its rugged topography and altitude, Bhutan has limited resources of productive land. Areas of accessible, arable land with fertile soils are a precious resource for national food security, and rural communities' economic prosperity and well-being. In recent decades, various types of land degradation have increased, as population increases and development proceeds. Surveys show that water-induced degradation – specifically gullies, landslides, ravine formation and local flooding – is most prominent and devastating, and is being worsened by changing rainfall patterns. In-situ chemical degradation includes depletion of soil organic matter and nutrient mining, or soil contamination through over-application of chemical fertilizers and pesticides. In-situ physical degradation, such as topsoil capping and subsoil compaction, is also significant. Other challenges include the absence of a comprehensive national soil map with information on crop suitability and potential, resulting in non-optimal utilization of land.

In many parts of the country with dryland farming on steep mountain slopes, topsoil erosion is resulting in declining soil productivity, affecting crop growth and yield. Direct factors causing degradation include overgrazing, unsustainable agricultural practices and poor irrigation system management, forest fires, excessive forest use, industrial activities, urbanization and infrastructure development (especially road construction), unsustainable mining, and poor management of solid waste. Indirect factors relate to population growth and structure, poverty, climate change, and policy and institutional issues. Poverty[17] and land degradation are inextricably linked – poorer communities are directly dependent on a wide range of ecosystem services for their livelihoods, and usually bear the brunt of land degradation.

Challenges related to infrastructure

Bhutan's road network includes 18,395km of highways, feeder and farm roads, complemented by protection walls, bridges, tunnels, trails and border infrastructure, means that 92% of

households now live within 30 minutes' walking distance from the nearest road head[18]. For most rural communities, a single road or bridge provides a lifeline to markets and social services, but one which is vulnerable to damage. Road networks and other public infrastructure such as irrigation channels, drainage systems, power lines, hydroelectric facilities and government services are highly vulnerable to damage by earthquake, and by flash floods and landslides. Every year during monsoon season, landslides forces multiple road closures on east west highways and north south highways disrupting communications, travel and trade, and causing substantial economic loss. In the past 15 years, such disasters have increased in frequency and impact[19], with increased rainfall, unpredictable timing and more intense extreme events, requiring huge expense for restoration works.


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Road construction using heavy machinery and cutting of steep slopes is environmentally challenging, considering the topography and fragile geological conditions. Farm roads built at minimal cost are often poorly engineered with little or no maintenance, and lack basic structures such as proper drainage and breast/retaining walls. This frequently causes land degradation around and below the road, and visual scarring of the landscape. Unplanned construction of farm roads can also have a negative impact on cultural and spiritual landscapes in some places, for example, where roads accidentally intersect historically important ritual sites.

Challenges related to agricultural land

Bhutan's improving agricultural productivity in recent decades has contributed significantly to achieving the goal of food self-sufficiency at household and gewog level, and also at national level[20]. In some areas this has been achieved through modernizing agriculture, intensifying production and expanding commercial production, for example, egg. In other areas, subsistence and small-scale farmers[21] have received government support on irrigation systems, high-yielding crop varieties and livestock breeding, and apply both traditional knowledge and modern techniques to improve production. At the same time, unsustainable farming practices are continued in pockets, including imbalanced and prolonged use of inorganic fertilizers, paddy farming on steep terrain without adequate soil and water conservation, burning of crop residues, failure to use cover crops, and tseri shifting cultivation without a long enough fallow cycle for soil replenishment. Construction of earthen irrigation canals in places where the soil is highly erodible, and poor maintenance of irrigation systems, as well as poor construction of farm roads, can cause erosion and downward movement of slopes. Large herds of livestock are important for social standing, but can lead to overgrazing and degradation, especially where extensive grazing is practised, allowing livestock into the forest.

Other sustainability challenges include land fragmentation, and shortage of suitable agricultural land. Some arable land has been lost to urbanization, with other areas suffering from land degradation and low soil fertility. In many areas there is an increase in the area of land left fallow and unproductive, and also the

area converted from wetland rice production to dryland agriculture[22]. Contributing causes include a shortage of labour and a lack of sufficient irrigation, sometimes as result of drying up of water sources. This is worsened by climate change impacts on rainfall patterns – the late arrival of monsoons can lead to drought and crop failure in some districts, while intense concentrated rainfall can destroy crops and erode farmlands elsewhere. Other challenges include destruction of crops by wild animals, outbreaks of pests and disease, and the widespread shortage of farm labour[23], as many men seek work in towns and cities.

Challenges related to mining

Minerals are an important component of the natural resource endowment of the Kingdom of Bhutan, and were highlighted as a key area for sustainable growth in the 1998 document, *The Middle Path*. At the same time, the exploitation of this resource has to be managed to enable human well-being, protection of the environment, and preservation of the Kingdom's precious religious and cultural heritage. Bhutan's mining and minerals industry has experienced steady growth in recent years[24]. Between 2004 and 2016, there were 65 quarries and 37 mines in operation nationally, covering an area of 812 hectares and 1,255 hectares respectively[25] – with mostly open cast operations producing limestone, coal, iron ore, graphite, talc, gypsum, quartzite, granite, marble, slate and dolomite.

Uncontrolled stone quarries and surface collection of stones, boulders and sand in some areas is causing landslides, erosion of hillsides and riverbanks, and air pollution through dust. Even legal open cast mining causes irreversible changes to the natural landscape, with serious impacts on local communities and the ecosystems on which they depend. Impacts include, land disturbance and fissure from drilling, blasting, excavation and site clearance, destruction of natural vegetation, sedimentation and contamination of waters, noise pollution, and air pollution – with dust particles affecting human health and local livelihoods such as agricultural production. There is frequently poor implementation of existing policies and laws to address these issues, e.g. lack of spraying to suppress dust, no restoration of vegetation after closure, and dumping of valuable topsoil. Stringent laws, strategies and regulations are in place for mitigation during planning, operation and post-operation phases. However, these tools have not been effectively enforced due to lack of inter-agency coordination, ambiguous institutional mechanisms for enforcement, and inadequate technical capacity within the mining companies, and even within government, in terms of capacity to monitor and provide technical guidance.

Challenges related to urban growth

Urbanization in Bhutan has taken place at a rapid pace in recent decades, with both seasonal and long-term migration from rural to urban areas, and from eastern to western regions. In 2002 it was estimated that the urban population comprised only 15% of the total population. By 2017, this number had increased to 37.8%, with more than half of the urban population concentrated in Thimphu and Phuentsholing[26]. In addition to the four major urban centres, or Class A Thromdes, a wide number of Dzongkhag Thromdes and Yenlag Thromdes (satellite towns) have been demarcated and approved. Often, towns have expanded before thorough urban planning could take place, leading to inadequate infrastructure, land speculation, unplanned and illegal development, land degradation and pressure on surrounding forests, and exposure to disaster risks.

With rural-urban migration has come a break-down in the social safety net that traditionally ensured a communally constructed home for all. Most urban centres and in the larger towns, lack of proper infrastructure, shortage of afford-able housing, high rental costs and poor facilities for drainage, sanitation and waste disposal and drinking water are major concern. Dense urban living also creates environmental challenges such

as air and water pollution, congestion of traffic and buildings, noise pollution from vehicles, construction work and commercial activities. Despite some investment in urban parks many urban communities lack safe, well-lit footpaths, and clean green spaces for social engagement, recreation and sports. Although positive urban planning policies and regulations are in place, there are inadequate human and financial resources in place for monitoring and enforcement mechanisms, and lack of public awareness and support.

Challenges related to waste

Waste management is a growing challenge for Bhutan, as in most developing economies, threatening to have negative impacts on water, air and soil quality, as well as quality of life. Increased population growth, economic activities and urbanization with changing consumption patterns generates growing quantities of solid waste, as well as liquid effluent and air pollution. The total quantity of solid waste generated from across the whole country was estimated at about 861.36 tons per week in 2018[27]. Despite several policy advances, there is a lack of coordinated planning across institutions for integrated waste management, and a shortage of human and financial resources to implement and enforce legislation.

Until recently, there has also been chronic under-resourcing of infrastructure for waste management. This includes rural areas, where waste is an emerging issue and health workers are promoting simple pits for the proper disposal of waste. Waste collection systems have been established in most urban centres, but landfills are poorly managed, and wastewater systems are inadequate, with many leaking septic tanks. With rapid growth in consumption of imported, non-biodegradable goods, there is an increasing litter and dumping problem, something unknown in traditional Bhutanese society. Policies are in place to promote recycling, but there are few proper waste segregation systems at source, and no treatment of greywater for reuse. Apart from Pasakha, industrial areas lack dedicated industrial waste sites. There are still no regular and widespread measures in place to monitor and control pollutant emission and effluent leaching, leading to contamination of land and water, and aesthetic dilapidation of the landscape. Medical waste and electronic or "e"-waste pose special challenges, due to lack of capacity, facilities and resources.


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Based on existing policy, legislation, rules and regulations and guidelines, Bhutan's National Environment Strategy has the following land-related Strategic Objectives:

- *Strategic Objective 1:* Plan for balanced land use
- *Strategic Objective 2*: Enhance disaster preparedness and response
- *Strategic Objective 3*: Combat land degradation
- *Strategic Objective 4*: Promote environmentally friendly roads and infrastructure
- *Strategic Objective 5*: Make agriculture sustainable and climate-resilient
- *Strategic Objective 6*: Manage mineral extraction wisely
- *Strategic Objective 7*: Ensure green, sustainable settlements
- *Strategic Objective 8*: Manage waste responsibly.

STRATEGIC OBJECTIVE 1: PLAN FOR BALANCED LAND USE

	Document focus	Competent authorities
The Land Act of Bhutan 2007	Establishes the National Land Commission, and regulates ownership and use of land for socio- economic development and environmental well-being	National Land Commission; Ministry of Economic Affairs; Ministry of Agriculture and Forests; Ministry of Works and Human Settlements, Thromde Administrations
Land Lease Rules and Regulations, 2018	Sets rules and regulations for the leasing of State Reserve Forest Land for mining, hydropower, commercial agriculture etc.	
National Land Use Zoning Implementation Guidelines 2018	Zoning exercise will enable establishment of a harmonized national land use and governance system	National Land Commission, Gross National Happiness Commission
National Geo-Information Policy, 2018	Institutes institutional and legal framework for reliable geo-information, accessibility and sharing mechanisms	
Guideline for development of industrial land	Establishment of industrial parks and estates for cluster of industries, maximizing land use	Department of Industry, Ministry of Economic Affairs

Lease out state land strategically

With growing pressure on scarce land resources and the need to guide economic development to avoid any harmful effect of people's well-being and happiness, Bhutan is placing concerted efforts on improving the system both for leasing out state land. This includes issuing Land Use Certificates (LUC) to allocate State land to unemployed youth to create job opportunities in farming and agri-processing. Great emphasis is placed on forward planning to enhance prudent utilization and sustainable management, limited land resources, and valuable cultural landscapes. Bhutan's *Land Lease Rules and Regulations, 2018* guide the leasing of State Reserve Forest Land at Dzongkhag and Thromde levels, for mining, commercial agriculture, business activities, tsamdro (pastureland), sokshing (tree groves reserved for collection of leaves), and civil society organizations.

Strengthen environmental impact assessment

Bhutan introduced Environmental Impact Assessment (EIA) into the decision-making process for land use change and new development in the 2000s, through the *Environment Assessment Act, 2000*, and *Regulation for Environmental Clearance of Projects, 2016*. Under this legislation, project developers are mandated to conduct an Environmental Assessment, often broadened nowadays to a socio-economic and environmental assessment, and sometimes a wider Strategic Environmental Assessment (SEA) in terms of the *Strategic Environmental Assessment Regulation, 2002*. Where necessary, an Environmental and Social Management Framework (ESMF) is put in place to guide development so that risks of negative impacts are mitigated. Action for stricter adherence to the legislation will enable the application of the mitigation hierarchy, in which negative social and environmental effects are avoided if

possible, mitigated where unavoidable, and rehabilitation measures put in place.

Establish land use and governance system

Bhutan has issued *National Land Use Zoning Implementation Guidelines, 2018* to enable establishment of a harmonized national land use and governance system for integrated socio-economic development. The guidelines acknowledge the urgent need to assess the present and future needs of land by evaluating its capability to meet the competing demand for its uses, striving to bring about the desired socio-economic and environmental well-being of our citizenry, as well as preserving our cultural landscapes. This includes planning for equity in service delivery and economic development across rural and urban areas to slow the rate or urbanization. Actions include a National Land Use Zoning exercise that will foster coordination among implementing agencies and consolidate stakeholder collaboration, providing a scientific basis for good land governance and an agreed spatial vision of the country's overall development. Existing National Parks, Biological Corridors, Agriculture Land, Industrial Areas, Human Settlements and Heritage Sites will be revalidated and delineated.

Ensure optimum utilization of arable land

One goal of the new national land use and governance system is to ensure optimal utilization of land, based on analysis of needs and suitability. Given the small percentage of the country that has accessible, arable land with fertile soils, and the Constitutional imperative to maintain 60% forest cover, it is vital to ensure that all land suitable for agriculture is intensively and sustainably utilized for that purpose. Systematic land governance, combined with support to farmers on improved inputs, will enable sustainable intensification of agriculture on already transformed land, allowing for intensive and multiple use where appropriate, and preventing land from lying fallow (except where practised deliberately to restore productivity). Action to undertake land reclamation can also be practised where appropriate, bearing in mind the need for resilience against climate change impacts.

STRATEGIC OBJECTIVE 2: ENHANCE DISASTER PREPAREDNESS AND RESPONSE

	Document focus	Competent authorities
Disaster Management Act of Bhutan, 2013	Strengthens institutions for mainstreaming risk reduction, and coordinated disaster management with community participation	Department of Disaster Management, Department of Local Governance, Ministry of Home and Cultural Affairs; National Centre for Hydrology and Meteorology; Ministry of Finance; National Disaster Management Authority; National Environment Commission; National Land Commission; Ministry of Economic Affairs
Disaster Management Rules and Regulations, 2014	Establishes coordination and facilitation mechanisms for international teams during response and relief operations	
Disaster Risk Management Strategy: "Safe, Resilient and Happy Bhutan", 2017	Provides guidance on Disaster Risk Management, roles for agencies and stakeholders and links to Climate Change Adaptation and sustainable development	

Plan for disaster risk management

As a signatory to the UN Framework Convention on Climate Change and the Sendai Framework for Disaster Risk Reduction, Bhutan has put in place a number of policies to manage disaster risk, even as it increases with climate change. Bhutan's *Disaster Risk Management Strategy, 2017* is formulated in terms of the *Disaster Management Act of Bhutan, 2013* and is guided by the Five Year Planning process, providing the principles, strategies and priorities to guide programs for risk prevention and reduction, preparedness and emergency response, and post-disaster recovery and reconstruction measures. It is formulated with long term perspective, provides guidance for the development of medium-term disaster management plans at all levels of government, and is well aligned with the four Priority Actions of the Sendai Framework, 2015 – 2030.


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Adapt to climate change impacts

Building on Bhutan's *National Adaptation Program of Action, 2006*, (updated in 2012), the country's *Nationally Determined Contribution, 2015* through the UNFCCC outlines the country's plan for adapting to the anticipated impacts of climate change. This includes improvement of the hydrometeorological network and weather and flood forecasting to adequate temporal and spatial scales. It also aims to strengthen resilience to climate change-intensified hazards through the following actions: i) improved monitoring and detection of hydromet extremes using remote sensing and satellite-based technologies; ii) continual assessment of potentially dangerous glacial lakes and improvement of early warning systems for outburst flooding; iii) a monitoring, assessment and warning system for flash floods and landslides; iv) forest fire and windstorm risk assessment and management; v) Strengthen the resilience of road, public infrastucture and human settlement from natural disaster vi) improved emergency medical services and public health management for disaster response; and vii) enhancing disaster preparedness and response at national and local levels.

Strengthen disaster preparedness and response

In terms of the *Disaster Risk Management Strategy, 2017* the Royal Government of Bhutan is running a series of capacity building interventions with a range of government agencies, including issuing warnings and evacuating communities, conducting search and rescue operations, ensuring emergency communications at dzongkhag and gewog levels through satellite phone and VHF, and planning logistics for emergency medical, food and water supplies. A five-year program implemented by the Ministry of Home and Cultural Affairs on "Enhancement of disaster risk reduction and management" will strengthen disaster preparedness, response and recovery capacity. A key action involves establishing Emergency Operation Centres at national and dzongkhag levels, with trained Disaster Management Committees and contingency plans in place. A network of well-equipped and trained first responders and teams for search and rescue will be supported by emergency medical services and protocols for public health management in time of disaster.

Issue early warnings to vulnerable communities

As part of Bhutan's adaptation to anticipated impacts of climate change, with increased intensity and frequency of disasters, a network of real-time automated weather monitoring and forecasting stations is being established. This will feed into a system for disseminating extreme weather warnings, especially flash flood, glacial lake outburst flooding (GLOF) and landslide risks. Public awareness will be promoted, with emergency preparedness plans for communities likely to be affected, including evacuation where necessary. In addition, a five-year program is being implemented through the National Centre for Hydrology and Meteorology on "Hydrology, cryosphere and water resources information and early warning services", taking action to strengthen institutional capacity including infrastructure for regular monitoring, risk assessment and early warning system of natural disaster.

STRATEGIC OBJECTIVE 3: COMBAT LAND DEGRADATION

	Document focus	Competent authorities
National Action Program (NAP) to Combat Land Degradation, 2014	Aims to prevent and mitigate land degradation and its impacts through Sustainable Land Management (SLM) to protect and maintain landscape's economic, ecological and aesthetic values	Ministry of Agriculture and Forests - National Soil Services Centre, Department of Agriculture, Department of Forest & Park Services, Department of Livestock; Ministry of Works and Human Settlements - Department of Roads, Department of Human Settlement; National Environment Commission; Dzongkhag and Gewog administrations; National Land Commission Secretariat; Ministry of Economic Affairs - Department of Geology and Mines, Department of Renewable Energy, Department of Industry; Ministry of Home and Cultural Affairs - Department of Disaster Management
Bhutan - Land Degradation Neutrality National Report, 2015	LDN National Voluntary Target and Strategy aims to operationalize the National Action Program (NAP) to combat land degradation, focusing on five sites	
Agriculture Land Development Guideline, 2017	Aims to provide a uniform, focused and standardized approach towards agriculture land development to address issues that confront sustainable agriculture production such as land degradation, fallowing of land etc.	

Because of the cross-cutting nature of both land degradation and sustainable land management, a number of policies are relevant in Bhutan's efforts to combat land degradation, in addition to those listed in the table above. Relevant policies include: the *Agriculture Land Development Guidelines 2017*, *Farm Road Guidelines 2013*, *National Forest Policy 2009*, *National Food and Nutrition Security Policy 2014*, *National Environment Strategy 1998*, *Bhutan Water Policy 2007*, *National Urbanization Strategy 2008*, *and Bhutan Sustainable Hydropower Development Policy 2008*. Relevant laws include: *the Forest and Nature Conservation Act 1995*, *Mines and Mineral Management Act 1995*, *Environmental Assessment Act 2000*, *Road Act of Bhutan 2014*, *National Environmental Protection Act 2007*, *Land Act of Bhutan 2007*, and *Waste Prevention and Management Act 2009*.

Plan for Land Degradation Neutrality

As a signatory to the United Nations Convention to Combat Desertification (UNCCD) from 2003, Bhutan is committed to the target of Land Degradation Neutrality – a global commitment to halt and reverse land degradation by 2030, which means in practice that agricultural, forest and wetlands need to be restored at least as fast as they are being degraded or lost. Following a 2010 version, Bhutan's *National Action Program (NAP) to Combat Land Degradation, 2014* was realigned with UNCCD's 10-year Strategy (2008-2018). Bhutan's *Land Degradation Neutrality Na-*

tional Report, 2015 sets specific numerical and time-bound LDN Targets relating to Sustainable Land Management (SLM) measures, and targets on reforestation with both native and commercial species, promotion of wood substitute products, improvement of pastures and livestock breeds, protection of wetlands and reclamation of severely degraded areas. Key actions include mapping and monitoring of land degradation, and digital mapping of soil organic carbon stocks.

Reduce land degradation

The National Action Program sets out a multifaceted strategy involving all the role-players listed above, in maximizing the availability of productive croplands, floodplains and forest resources. This is being achieved through: i) conservation, rehabilitation and sustainable use of forest resources to maintain well-functioning landscapes and watersheds; ii) development and promotion of sustainable agricultural practices that enhance livelihoods whilst maintaining productivity and stability of agricultural lands; iii) integration of environmental management measures in development activities that pose significant risks of land degradation; iv) strengthening of systemic and institutional capacity to combat land degradation; and v) information, advocacy and education to create increased policy and public support for sustainable land management.

Practice sustainable land management

A key element of sustainable land management (SLM) in Bhutan involves preventing erosion of topsoil and loss of fertility on steeply sloping land, through careful land development including constructing terraces for crops. SLM is now implemented as a regular program of the National Soil Service Centre, with guidelines on best practices of SLM, farm roads and land development. International partnerships through the UNCCD are enabling pilot activities to be carried out in five highly vulnerable and/or degraded agricultural and forest sites – establishing contour hedgerows and stone bunds, and stabilizing gullies through construction of check dams, plantation of bamboos and fast-growing pioneer native species such as *Alnus nepalensis*. Such activities are challenging, especially in remote areas and communities with labour shortages, but are vital to maintaining slope stability and productivity of land and forest resources.

Restore degraded landscapes

Bhutan's *National Forest Policy, 2010* prioritizes restoration and the reclamation of degraded lands with reforestation and watershed development programs, including through the establishment of plantations (timber and tree crops), enrichment planting, and support for community and private forestry. Eight new management plans have been prepared for degraded watersheds, and assessments were completed assessment of 120 watersheds within sub-basins. Several plantation activities have been carried out by the Department of Forests and Park Services and Green Bhutan Project, involving reforestation with native tree species, including the Himalayan Cypress, national tree of Bhutan, and other conifers, willows, poplars and oaks. Actions are being undertaken to do bioengineering works to restore and stabilize slopes adjacent to highways that have been identified as vulnerable to extreme events intensified by climate change.

STRATEGIC OBJECTIVE 4: PROMOTE ENVIRONMENTALLY FRIENDLY ROADS AND INFRASTRUCTURE

	Document focus	Competent authorities
Road Act of the Kingdom of Bhutan, 2013	Sets standards for road construction and maintenance	Department of Roads (DoR), Department of Engineering Services (DES), Ministry of Works and Human Settlement; Department of Geology and Mines, Ministry of Economic Affairs; Dzongkhag, Thromde and Gewog Administrations
Road Rules and Regulations of the Kingdom of Bhutan, 2016	Updates standards and clearly defines roles and responsibilities of the governmental bodies at and road users in relation to road network	
Disaster Risk Management Strategy: 2017	Incudes revised building standards to reflect current and updated state of hazard and risk information, for roads, bridges and protection walls	Department of Disaster Management, Department of Local Governance, Ministry of Home and Cultural Affairs, National Disaster Management Authority

Climate-proof transport infrastructure

Bhutan's *National Adaptation Program of Action, 2006* (updated in 2012) highlighted the importance of highway and road protection against hazards intensified by climate change – including conducting landslide assessments, establishing early warning systems, and strengthening the Geotechnical Unit in the Department of Roads. Bhutan's *Nationally Determined Contribution, 2015* through the UN Framework Convention on Climate Change (UNFCCC) commits the country to climate proofing transport infrastructure against landslides and flash floods. More resilient construction techniques are needed for new roads and bridges, and when rebuilding after damage, and existing infrastructure can be reinforced in high risk areas. Although such techniques increase the cost of road building, substantial savings may be made over a period of time by not having to repair or rebuild repeatedly following the monsoon[28]. A database for road slope failure along PNH1 (Thimphu-Trashigang) and PNH4 (Gelephu-Trongsa) has been developed and a key action is to update the existing hazard zonation of the entire road network, through a Geo-Hazard Risk Assessment and Resilient Asset Management plan.

Construct environmentally friendly roads

Over the past two decades, Bhutan has made progress on environmentally friendly road construction – planning the alignment of new roads carefully to avoid areas of ecological sensitivity, as well as cultural heritage sites; and minimizing the destabilization of slopes by: avoiding full cuts wherever possible, using excavators rather than bulldozers and limiting blasting or using controlled blasting techniques, adding log or boul-


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der barriers to control excavated material rolling downhill during construction, managing water flow carefully, stabilizing slopes with retaining structures, and undertaking bio-engineering for revegetation with retained topsoil. In stretches of road that have been damaged by flash floods, erosion and landslides, repairs have been done using new techniques. Action is needed to enhance planning and budgeting for road construction to utilize these best practice techniques.

Plan farm roads better

Farm roads are critical for connectivity, access to markets and delivery of services to rural communities. Government is working to ensure better compliance with the *Farm Road Guidelines, 2013* carrying out proper surveys and needs assessments before construction begins, including scoping for any potential negative impact on cultural and spiritual landscapes or historically important ritual sites. Sufficient resources must be available for measures to avoid erosion during construction, and to undertake rehabilitation and bioengineering afterwards – to prevent erosion and landslides that could occur if heavy rains follow construction while slopes remain bare. In addition, Gewog and Dzongkhag administration budgeting must take into account the basic structures needed for a useable and beneficial road following environment friendly techniques. An important action is conducting capacity development on environmentally friendly and climate smart construction with communities and Gewog officials.


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STRATEGIC OBJECTIVE 5: MAKE AGRICULTURE SUSTAINABLE AND CLIMATE-RESILIENT

	Document focus	Competent authorities
Livestock Act of Bhutan, 2001	Regulates livestock breeding, health and production to enhance their productivity and prevent diseases	Department of Livestock, Department of Agriculture, Ministry of Agriculture and Forests
Pesticide Act, 2000	Encourages organic agriculture and integrated pest management with a centralized system that controls and limits the import, sale and use of pesticides	
National Adaptation Program of Action, 2006, updated in 2012	Highlights vulnerability of agriculture to climate change and prioritizes rainwater harvesting and weather forecasting	Policy and Planning Division, Ministry of Agriculture and Forests
Food and Nutrition Security Policy, 2014	Aims to enable a conducive environment for a healthy population through physical, economic and social access to safe and adequate nutritious food	Ministry of Agriculture and Forests – Department of Livestock, Department of Agriculture; Ministry of Health; Department of Trade, Ministry of Economic Affairs
National Irrigation Master Plan, 2016	Presents a 15-year action plan for development of climate-adaptive irrigation systems for food security and rural incomes	Irrigation Division, Department of Agriculture, Ministry of Agriculture and Forests
National Framework for Organic Farming in Bhutan, 2007	Provides the guiding principles for promoting organic agriculture as a sustainable agriculture practice	Ministry of Agriculture and Forests

Important guidance to the sustainable management of the agriculture sector is provided by the above-mentioned policies and laws, as well as the *Seeds Act of Bhutan, 2000*; the *Livestock Sector Development Policy, 2012 (Working Document)*; *Livestock Rules and Regulations, 2017*; *Co-operative (Amendment) Act of Bhutan, 2009*; *Food Act of Bhutan, 2005*; *Land Act of Bhutan, 2007*; *Biosafety Act of Bhutan, 2015*; *Water Act of Bhutan, 2011*; *National Irrigation Policy, 2012*; *Renewable Natural Resources (RNR) Research Policy, 2012* and the *Water Regulations of Bhutan, 2014*.

Protect agriculture against climate change

Bhutan's *Food and Nutrition Security Policy, 2014* acknowledges that climate change is likely to have a serious effect on food production, with slow onset changes in mean temperatures and precipitation patterns expected to affect yields, and crop losses resulting from more frequent and intense extreme weather events. The *National Action Plan to Combat Land Degradation, 2014* addresses strengthening sustainable management practices in agriculture. The *National Adaptation Program of Action, 2006* (updated in 2012) sets out adaptation actions including: introducing crop and livestock varieties with greater resilience to drought and extreme temperatures; improving terracing and contour bunding, promoting agro-forestry to reduce soil erosion and run-off on steep slopes; and upgrading storage facilities to store surplus grains as insurance against crop loss or bad yields. A five-year program being implemented by the Ministry of Agriculture and Forests on "Climate smart and disaster-resilient development" aims to formulate and implement climate change responsive policies in agriculture and farming, promoting green climate technologies for management of pests, diseases and disaster in the agriculture sector. A five-year program to be implemented by the National Centre for Hydrology and Metrology (NCHM) on "Weather and climate services for building climate resilience" includes action to develop reliable weather and seasonal climate forecasts; as well as agro-met, aviation and weather warning services, critical for farming households' capacity to adapt to climate change.

Provide adequate irrigation

The *National Irrigation Master Plan, 2016* presents a 15-year action plan and roadmap for the development of climate adaptive irrigation systems and irrigated agriculture in the country, to help attain the broad agriculture sector goals of food and nutrition security and enhanced rural incomes, despite anticipated climate change impacts on seasonal water availability. The Engineering Division in the Department of Agriculture will support Dzongkhags and Water User Associations to expand existing community managed irrigation systems across 64,000 acres of land nationally over this period, and bring 19,000 acres of land under assured irrigation, with crops suitable for each of five irrigation zones promoted. Key actions include support to repair damaged and leaking canals, and providing new water supply to the existing Chuzhing to help prevent their conversion to Kamzhing. These actions will be complemented by awareness and education on preserving irrigation water, and field inspections to assess and verify planned conversions.

Improve farm productivity

Despite an increase in investment, Bhutan faces several challenges for agricultural development, including low agricultural productivity. A key intervention to address this is promoting and subsidizing farm mechanization, along with provision of inputs like expanded irrigation, improved seeds and climate-smart technology – encouraging cultivation of fallow land and intensification on existing cropland. Crop rotation and mixed cropping are supported through agricultural extension services, to address nutrient depletion and restore soil fertility, especially in eastern parts of the country where shifting cultivation

(norbugang/dechenling) can no longer be practised. Compost making is encouraged, along with traditional use of leaf litter and manure. Government is also taking action to engage youth in commercial farming, and investigating financial incentives to farmers to enhance production and productivity, stabilize prices and expand exports. Where appropriate, support will be given to protected agriculture, e.g. greenhouse and tunnel farming, and promoting climate-resilient crops to tolerate heat and drought conditions.

Reduce open grazing of livestock

In terms of the *Livestock Sector Development Policy, 2012* (Draft working paper), the Ministry of Agriculture and Forests is promoting more sustainable climate-smart agriculture and livestock farming. Farmers are encouraged to control livestock more closely, to prevent or reduce open grazing along verges and in the forest, and to practise supplementary stall feedings. Reduction of herd sizes to remove unproductive cattle, sheep and goats is also promoted, along with breeding of improved livestock varieties that are resilient to changes in climatic conditions. Cultivation of fodder crops is important to provide the source of nutrients for stall feeding. Bhutan's *Nationally Determined Contribution, 2015*, through the UNFCCC reiterates a commitment to resilient livestock farming, improvement of breeds and livestock insurance schemes, as well as biogas production with stall feeding. It also highlights the importance of agroforestry and silvopastoral approaches for fodder production, as well as organic farming, conservation agriculture and sustainable land management practices.

Promote organic farming

Guided by the *National Framework for Organic Farming in Bhutan, 2007*, recent decades have seen a growing movement for the country's agriculture sector to become wholly organic, and thus able to access niche export markets in Asia and worldwide. An estimated 70% of produce is already grown without chemical fertilizers or pesticides, making the shift potentially achievable. Others believe that a more appropriate strategy involves an emphasis on natural production


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with limited application of fertilizers/pesticides. Bhutan's *Renewable Natural Resource Marketing Policy, 2017* encourages organic food producers to adopt "Made in Bhutan" and "Grown in Bhutan" labelling, to export their produce to regional and international markets. A five-year Organic Flagship Program led by the Ministry of Agriculture and Forests aims to commercialize organic production of 12 commodities – providing access to bio-inputs and organic seeds for 33,0000 farm households, developing an organic value chain and market system, and developing and operationalizing organic certification systems[29]. Government is taking action to promote the engagement of youth in commercial and organic farming, through an Implementation Manual for Land Use Certificate Program.

Maximize use of sustainable inputs

Since the removal of the pesticide subsidy two decades ago, and the banning of several hazardous chemicals from the market for environmental reasons, there has been a decline in use of pesticides. The use of glyphosate and other illegal chemicals to kill weeds must be stopped completely through strictly enforcing the Pesticide Act. In some parts of the country, chemical fertilizer use has increased in recent years, especially to grow cash crops like apples and potatoes, and partly as a response to concerns about future climate change impacts on yields. This has enhanced productivity, but in some areas has led to indiscriminate use, with resulting contamination of soil and water resources. In support of sustainable and organic farming, Dzongkhag governments are supporting the capacity development of cottage industries to supply bio-fertilizers to supplement household manure, and bio-chemicals based on traditional pest control knowledge. Research is also ongoing on surveillance of and means to combat shifts in pests and diseases anticipated with climate change. Through Bhutan's participation in global initiatives for Sustainable Consumption and Production (SCP), actions are being taken to develop institutional and technical capacity for applying a circular economy approach in the agriculture sector, maximizing use of crop residues and manure for biogas slurry, for fuel as well as fertilizers.

STRATEGIC OBJECTIVE 6: MANAGE MINERAL EXTRACTION WISELY

	Document focus	Competent authorities
Mines and Minerals Management Act of the kingdom of Bhutan, 1995	Ensures the exploitation of mineral resources in a manner compatible with the social and economic policies of country	Department of Geology and Mines, Ministry of Economic Affairs; Ministry of Works and Human Settlement; Ministry of Health; Ministry of Labour and Human Resources
Mines and minerals Management Regulation 2002	Sets out procedures to enable the implementation of the act, including environmental regulations	
Economic Development Policy, 2010	Recognizes mining as one of five key economic sectors with major impact and growth potential	
Mineral Development Policy, 2017	Includes standards on environmental protection, and provides for environmental assessments, management and mitigation plans	Department of Geology and Mines, Ministry of Economic Affairs; new Mining Regulatory Authority

Strengthen protection and regulation regime

The *Mineral Development Policy, 2017* affirms that Government will strengthen the enforcement of mining and environmental laws to give consideration to sustainable development and intergenerational equity. The various stages of mineral development – from exploration, mining and production, to mine closure and reclamation – are to be based on sound, scientific and engineering principles, following a risk-informed approach. This involves strengthening the environmental protection and regulatory regime, and streamlining relevant agencies, departments and organizations for effective coordination. Existing legislation recommends Strategic Environmental Assessment for new or updated public-private partnerships before a licence can be issued. A Cumulative Impact Assessment and Carrying


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Capacity is required for concentrated mines and quarries, to control proliferation of mines beyond the environmental bearing capacity of a given area. These assessments include a properly designed Mine Plan and Environmental Manage-

ment and Mitigation Plan. Action is needed to ensure that sufficient resources are maintained in the Environmental Reclamation Fund to implement the Mine Closure and Reclamation Plan at the end of each mining lifecycle.

Plan sustainably for the sector

As the country moves to implement the *Mineral Development Policy, 2017* future decisions on exploitation of resources will be guided by the needs of Gross National Happiness, including balancing revenue generation and economic development with human health and well-being. In addition, the Constitutional imperative to maintain 60% forest cover effectively places limits on where mining and quarrying can take place. Following the guidelines in the policy, detailed geological assessment and mapping of mineral resources covering the entire country at a more detailed scale will continue. Based on this geo-scientific information and cost-benefit analysis (with social, economic and environmental parameters), a long-term national spatial plan can be developed for sustainable mining development, integrating the principles and practices of inter-generational equity and value-addition.

Increase value addition to minerals

In line with the principle of value addition in the *Minerals Development Policy, 2017*, the Royal Government of Bhutan is working to promote minerals processing industries and value addition to mineral resources. This will optimize mining revenue, reduce the need for imports, develop knowledge and skills in the mining industry, and broaden the employment base. In addition, in line with the principle of a circular economy contained in the *National Waste Management Strategy, 2019*, minerals processing methods can be improved, enabling beneficiation, blending and utilization of low-grade ore, and recovery of additional minerals. The mining sector is a potential focus area for Bhutan's participation in global initiatives aiming to strengthen the country's institutional and technical capacity for Sustainable Consumption and Production (SCP), and actions can be taken to conduct mining life cycle analyses and identify opportunities for investment in recycling and beneficiation.

STRATEGIC OBJECTIVE 7: ENSURE GREEN, SUSTAINABLE SETTLEMENTS

	Document focus	Competent authorities
Guideline for Planning and Development of Human Settlements in Urban and Rural Areas of Bhutan to Minimize Environmental Impacts, 2013	Provides guidelines for urban and rural settlements using best practices in planning and construction for environmental conservation, climate change resilience and poverty reduction	Ministry of Works & Human Settlement: Policy and Planning Division, Department of Human Settlement, Department of Engineering Services; Gross National Happiness Commission; National Land Commission Secretariat; National Commission for Women and Children; National Housing Development Corporation Limited; Department of Local Governance, Ministry of Home and Cultural Affairs; Department of Youth and Sports, Ministry of Education; Thimphu Municipality; Thimphu District; Ministry of Agriculture and Forests, National Environment Commission, National Statistical Bureau
Spatial Planning Standards, 2017	Guides the orderly development of human settlements, providing standards for National, Regional and Local Plans, protecting the environment and cultural identity, providing for public amenities and green species, planning infrastructural networks and sustainable use of resources and space	
National Human Settlements Strategy, 2017	Aims to ensure regionally balanced and integrated development and establish a roadmap for developing rural and urban settlements, acknowledging the resource inputs needed – land, water, energy, food and building materials, and the impacts on land, air and water	
National Human Settlement Policy 2019	To provide a framework for planning and development of environmentally sustainable, culturally and economically vibrant and disaster resilent human settlement	PPD, DHS, DES, MoWHS; MoAF; NEC; MoHCA and LGs

Promote regionally balanced development

Building on the *Bhutan National Urbanization Strategy, 2008* it was necessary to update and provide clear policies on urbanization and urban specific legislation – through the *National Human Settlement Policy 2019*, and *Draft Spatial Planning Act*, and the *Spatial Planning Standards, 2017* and *National Human Settlements Strategy, 2017*. The human settlements policy and the *Guideline for Planning and Development of Human Settlements in Urban and Rural Areas of Bhutan to Minimize Environmental Impacts, 2013* call for establishing more small urban developments across the country in areas with growth potential. Balanced economic development will be promoted through preparation of nationwide settlement plans with equitable resource allocation, including provision of electricity and telecommunication facilities. Such planning will aim to prevent unplanned settlement growth and loss of valuable land for cultivation.

Plan settlements within carrying capacity

Bhutan is committed to ensuring hierarchical land-use planning covering economic, social, environment aspects in the planning and development of human settlements, from comprehensive valley spatial planning to Local Area Plan and Neighbourhood nodes. The country's *Spatial Planning Standards, 2017* provide guidelines for how spatial plans should assess and take into account the carrying capacity of the planning area, including: (i) natural resources (protected areas, water bodies, mountains, etc.) to be protected from urban growth; (ii) cultural sites and landscapes to avoid excessive development pressure; (iii) agricultural potential to be preserved; (iv) land available for development; (v) available infrastructural networks and plans for future development; (vi) potential supply of water and electricity to support the development and the related costs; and (vii) demographic projections to assess the expected development of settlements. A five-year local government program on livability and human settlement development includes actions to improve urban amenities and infrastructures such as roads, footpaths, drainage, drinking water and public transport, guided by proper settlement plans with improved waste and pollution management systems.

Make cities climate-smart

Bhutan's *Nationally Determined Contribution*, 2015 highlights the country's commitment to promotion of climate-smart cities. Adaptation to climate change involves improving stormwater management and sewer systems to cope with intense monsoons. Mitigation of greenhouse gas emissions involves integration of low emission strategies in urban and rural settlements through green buildings, energy efficiency and sustainable construction methods, and strengthening municipal waste management, as well as tree planting in residential and industrial areas of cities. Sustainable construction is also an important theme of Bhutan's participation in global initiatives for Sustainable Consumption and Production (SCP), aiming to strengthen the country's institutional and technical capacity to design, implement and monitor science-based policy instruments for SCP. Three key programs of the Ministry of Works and Human Settlements involve actions i) to pursue green growth in construction industry; and ii) to enhance sustainability of human settlements; and iii) to improve and maintain climate resilience of road network.

STRATEGIC OBJECTIVE 8: MANAGE WASTE RESPONSIBLY

	Document focus	Competent authorities
National Environment Protection Act, 2007	Sets the overarching legal framework for environmental protection and management	Ministry of Works and Human Settlement, National Environment Commission, Ministry of Economic Affairs, Thimphu and Phuentsholing Thromdes, Ministry of Health, Ministry of Education, Ministry of Agriculture and Forests, Department of Revenue and Customs, Department of National Properties, Ministry of Finance, Ministry of and Information and Communication: Tourism Council of Bhutan; Office of the Armed Forces; Thromde, Dzongkhag and Gewog Administrations
Waste Prevention and Management Act, 2009	Aims to promote reduction, reuse, recycling and safe disposal of solid, liquid and gaseous wastes	
Waste Prevention and Management Regulations, 2012 and Amendment, 2016	Identifies roles in waste management system including monitoring, collection, segregation, treatment, storage, transportation, reduction, reuse, recycling and safe disposal; levying fees, charges and fines and preventing illegal waste	
Guideline for Disposal of Pharmaceutical Waste, 2014	Provides guidance on segregation, storage, transport, disposal of hazardous and non-hazardous medical waste	
Integrated Solid Waste Management Strategy, 2014	Sets short, medium and long term targets for three Rs and improvement of disposal sites	
National Waste Management Strategy, 2019	Deals with all waste streams, providing eight strategic tools for sound management of waste, with targets at different timescales, and addressing barriers to coordination and implementation	

Build capacity for integrated waste management

Building on the earlier *National Strategy and Action Plan, Integrated Solid Waste Management, 2007* and the *National Integrated Solid Waste Management Strategy, 2014*, Bhutan has developed the *National Waste Management Strategy, 2019*, attempting to address the barriers to implementation of these plans – including poor inter-institutional coordination, limited number of personnel and budget, lack of technical capacity of Thromdes, Dzongkhags and implementing/collaborating agencies, and lack of awareness and cooperation of the general public. The Strategy reaffirms the overall strategic goal to promote and move continuously towards "Zero Waste Bhutan by 2030" – through partnerships involving the public, industry, civil society organizations, government authorities at local and sectoral levels, municipalities, and development partners. Detailed and

achievable short term targets are set out for a five-year period, in the context of major long-term objectives around reducing and recovering waste, and improving service delivery, aligned with government's five-year program on "Strengthening waste prevention and management", with actions being implemented through the National Environment Commission Secretariat.

Promote sustainable production and consumption

The new emphasis on a fourth "R" – Responsibility, as well as Reduce, Reuse and Recycle – ties in with Bhutan's participation in global initiatives for Sustainable Consumption and Production (SCP)[30]. The *National Waste Management Strategy, 2019* points out that the traditional linear development model of "take, make, consume and dispose" generates unsustainable volumes of waste. The alternative involves the concept of a circular economy, in which products are traded in closed loops or 'cycles', aiming to retain as much value as possible, by allowing for the long life, optimal reuse, refurbishment, remanufacturing and recycling of products, parts and materials. Innovative examples of this are emerging with involvement of the private sector and volunteers, e.g. PET (Polyethylene terephthalate) bottle collection by schools linked with recycling industries, establishment of a plant for recycling plastic waste as road surfacing material, and replacement of plastic used for wrapping Erica nut and leaf.

Improve municipal waste management

Effective management of solid waste streams in the urban centres (especially Thimphu and Phuentsholing) is amongst the most pressing challenges the country faces, with 40 tonnes of solid waste produced in Thimphu per day in 2018[31]. New sanitary landfills need to be established in towns where they are lacking, and existing open dump landfills must be rehabilitated into sanitary landfills with the necessary environmental measures in place. Strict enforcement of the *Waste Prevention and Management Act, 2009* will prevent illegal dumping, and leaching and contamination by effluent from landfills. Integrated systems with segregation and sanitary landfills can be designed to maximize opportunities for circular economy activities that generate revenue, e.g. from compost and methane gas, and from recycling of electrotonic or "e"-waste components, including valuable metals. Key actions in large towns include making available waste bins for sorting and segregating, with improved collection and sorting services, and accompanying public advocacy and awareness.


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Minimize greenhouse gas emissions from waste

Reducing, reusing, recovering and recycling municipal waste are also effective and high impact means of reducing greenhouse gas (GHG) emissions, as outlined in Bhutan's *Nationally Determined Contribution, 2015*. Waste is one of the sectors that is used in determining the country's emissions for the National Communication of Green House Gas Emission Report. Methane gas emitted from landfill sites as a result of anaerobic organic waste decay, is a major source of man-made methane, and is 23 times more potent at trapping heat in the atmosphere than carbon dioxide. Waste gas from landfills can also be recovered for production of energy and connection to the national grid for electricity distribution, through well designed operations. In addition, when discarded materials are recycled, in a circular economy approach, they provide industries with an alternate source of raw materials, resulting in lower demand for virgin materials whose extraction, transport, and processing would be a major source of emissions.

Implementation Plan

	Lead agency	Collaborating agency	Enablers	Key Performance Indicators
SO1: Plan for balanced land use	GNHC & NLC	MoAF, MoEA, MoWHS, NEC, MoHCA	National Land use zoning project	Areas feasible for human settlement, ecological areas, agricultural areas identified & zoned. Tangible historical and cultural sites zoned and mapped
SO2: Enhance disaster preparedness and response	MoHCA	NCHM MOEA MOWHS LGs Mo F	• Disaster related data and information system • Financing for disaster management plans and response • 12th FYP (establishing search and rescue center, emergency operation center) • Disaster management and contingency planning guideline • Guidelines for disaster financing	Disaster management and contingency plan in place at national, local and agency level
SO3: Combat land degradation	National Soil Service Centre (DoA, MoAF)	Dzongkhags, LG, DDM	• UNCCDs land degradation neutrality project • Agriculture land development guideline 2017 • World Soils Day	• Area covered • No of SLMP carried out
SO4: Promote environmentally friendly and climate-resilient roads and infrastructure	DoR, MoWHS	DGM, MoEA; RSTA, MoIC; Foreign Aid	• National highways will be improved using Environment Friendly Road Construction techniques and climate proof technology	• Development of guideline for Design, construction and maintenance of Climate resilient roads; • Length of Road as Improved as Climate Resilient Road; • Initiate slope stabilization process on National Highways;

SO5: Make agriculture sustainable and climate-resilient	Department of Agriculture Department of Livestock	Dzongkhags, MoAF Regional and Central Programme, (ARDCs, Central Programs, RLDCs, RDTC), CNR, NCHM	• Climate Smart Agriculture in Bhutan: Country Profile • 12 FYP Document • National Organic Flagship Program • Agriculture Research Strategy (2018-2028) • Roadmap for Agromet Services in Bhutan	• No of technologies generated and adopted • Functional agromet decision support system
SO6: Manage mineral extraction sustainably	Department of Geology and Mines	LGs, DoFPS, NRDCL, Mining Companies	• Economic Development Policy 2010 • Mineral Development Policy 2017	• Revenue generation • Employment generation • Social and environmental safeguards
SO7: Ensure green, sustainable settlements	Department of Human Settlement	MoWHS. NLCS. Respective Dzongkhag Administrations	Existing National Human Settlement Policy 2019 Legislations/Guidelines. • Spatial Planning Standards Bill • Guideline for Planning and Development of Human Settlements to minimize Environmental Impact. • Strategic Program for Climate Resilience SPCR. • Comprehensive National Development Plan (CNDP) for Bhutan 2030.	• Prepared, Reviewed and Facilitated the preparation of settlement plans (addressing environmental issues.)

			• Bhutan Building Rules 2018. • Spatial Plans and Development Control Regulations. FYP Activities. • Preparation and facilitation of spatial plans at all level; valley, regional, structural and local area plans. • Awareness and coordination • programs on issues, principles and legislations pertaining to human settlement. • Compliance and development review of settlement plans and its implementation.	
SO8: Strengthen waste prevention and management		MoWHS MoH MoEA, DoI DoT MoAF DoFPS DoL DoA MoF DNP DRC MoIC DITT RSTA Dzongkhag Administration Gewog Administration Thromde DRA BNCA CSO Media Houses Armed Forces	• Waste Prevention and Management Act 2009 • Waste Prevention and Management Regulation 2012 and 2016 (Amendment) Regulation • Integrated Solid Waste Management Strategy 2014 • National Waste Management Strategy 2019	• Generation of waste reduced • Segregation a source improved • Recycling of waste enhanced • Collection services improved • Treatment facility improved • Linked to annual workplan • Capacity developed • Disposed waste in environmentally sound manner • PPP • EPR established

Endnotes

[1] https://www.statista.com, "Employment by economic sector in Bhutan"

[2] Department of Forest and Park Services, *Forest Facts and Figures 2018* – in 2017-2018, 37 forest fire incidences in 12 dzongkhags destroyed more than 16,000 acres of state forest reserve

[3] Department of Forest and Park Services, Ministry of Agriculture and Forests, *Forest Facts and Figures 2018*

[4] The percentage of total national land area that was under cultivation in 2016 was 2.75 %, as per the *Land Use and Land Cover of Bhutan 2016* assessment published by the Ministry of Agriculture and Forests

[5] Labour Force Survey, 2018

[6] National Statistics Bureau, *Bhutan at a glance 2018*; *12th Five Year Plan*, *2018-2023*

[7] Reports of Population and Housing Census of Bhutan (PHCB) 2017 - The 2017 PHCB national report and the reports for the 20 dzongkhag can be accessed from www.nsb.gov.bt

[8] Reaching USD 2,277 per annum by 2018 – Gross National Happiness Commission, 2018. *Bhutan: Towards Sustainable Graduation through Economic Diversification & Resilience*

[9] These reasons were widely reported in the four regional workshops held in Wangduephodrang, Bumthang, Phuentsholing and Trashigang, with all 20 Dzongkhags represented, as part of the formulation of the National Environment Strategy – see report on *Revision of the National Environment Strategy of Bhutan, National Stakeholder and the Task Force Member Workshop (16-17 October, 2019)*

[10] According to Renewable Natural Resources statistics from the Ministry of Agriculture and Forests, rice constitutes the major proportion of food commodities imported, with an increasing trend from 68,235 metric tonne (MT) in 2012 to 87,671 MT in 2016, indicating that domestic supply has not been able to keep pace with the increasing demand for rice over time.

[11] National Environment Commission, 2016 *State of the Environment* report

[12] National Land Commission, 2016

[13] Karma Choden Tshering, 2018. *Exploring the nature of encroachment of state land in the Kingdom of Bhuta*n (MSc Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente, Netherlands)

[14] 45% of the country has an elevation of over 3,000 metres

[15] Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), published in 2014

[16] The total economic damage to the country from Cyclone Aila in 2009 alone was estimated at around US$ 15 million

[17] An estimated 8.2% of the country's total population were still below the national poverty line (< Nu 2195.95 per person per month) in 2017, according to statistics from the Population and Housing Census Bureau, 2017

[18] Population and Housing Census Bureau, 2017 Census: The network of roads have expanded and about 92 percent of the households in the country are within 30 minutes of walking distance from the nearest motor road, which is an increase from 63 percent in 2005

[19] The climate-related disasters of the six eastern Dzongkhags in 2004 witnessed major loss of lives, damage to homes, crops and pasture land, and significant damage to infrastructure such as irrigation channels, power transmission facilities, bridges, farm and feeder roads

[20] Food security is defined as being able to meet consumption needs, particularly for staple food crops, from own production rather than by buying. During the 12 months preceding the 2017 census reference day, only 6.2 % of households experienced food insufficiency or not enough food to feed all household members

(2017 PHCB national report).

[21] Among the regular Bhutanese households (158,513), 60.4 percent reported that they own land. About 73 percent of households in rural areas own land compared to urban areas (38.7 percent).

[22] These trends were widely reported in the four regional workshops held in Wangduephodrang, Bumthang, Phuentsholing and Trashigang, with all 20 Dzongkhags represented, as part of the formulation of the National Environment Strategy – see report on *Revision of the National Environment Strategy of Bhutan, National Stakeholder and the Task Force Member Workshop (16-17 October, 2019)*

[23] In the 2017 census, 53% of farm households reported a shortage of labour (members (2017 PHCB national report).

[24] The 12th Five Year Plan indicates that by 2019, base metals and articles form 31% of all Bhutan's exports to India, with mineral products a further 11% of exports.

[25] 12th Five Year Plan, 2018-2023

[26] Population and Housing Census Bureau, 2017 Census

[27] 12th Five Year Plan, 2018-2023

[28] The EFRC project in Bhutan estimated that EFRC roads cost 15-25 percent higher than conventional roads during the construction phase. However, the additional costs would be nullified within 7-9 years due to low maintenance costs and over the long-term, EFRC roads would be much cheaper than conventional roads. The EFRC project estimated the cost of EFRC roads at around US$ 60,000 per km.

[29] The program will target the organic production of eight selected commodities for export and four for domestic consumption. The program aims to produce approximately 254,000 metric tonnes of bio-inputs within five years. It aims to generate approximately 1,500 new jobs and engage around 33,000 farmers across the country - 12th Five Year Plan, 2018-2023.

[30] These initiatives aim to strengthen institutional and technical capacity to design, implement and monitor science-based policy instruments for SCP

[31] Quoted in 12th Five Year Plan, 2018-2023.

Chapter 3:
AIR

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The environment in Bhutan is one of the most pristine in Asia – with clean air and water, vast areas of primeval forest, and quality of life for all at the centre of our philosophy of Gross National Happiness. As a carbon-negative country, Bhutan is also considered a world leader, maintaining greenhouse gas emissions significantly lower than the carbon sequestration capacity of the country's forests. Nevertheless, challenges are on the horizon as urbanization and economic development gather pace, with pockets of serious air pollution emerging, and growing greenhouse gas emissions.

Challenges related to emissions

Bhutan is fuelled by renewable hydropower electricity, is home to a relatively small population, and has a nascent industrial sector. As a result, GHG emissions have remained relatively low. The Constitutional requirement to maintain Bhutan's forest cover[1] above 60% will maintain this massive carbon sink, sequestering more carbon than is emitted, and allowing the country to remain carbon negative. Nevertheless, emissions have been growing in the transport and industry sectors, contributing both to rising GHG emissions, and to increasing air pollution.

Inefficient energy use

One contributing factor to greenhouse gas emissions is inefficient use of energy, in the form of electricity, fossil fuels and biomass. In 2018 Bhutan imported close to USD 108 million worth of fossil fuel, that accounted for more than 67% of the earnings from hydropower export[2]. The top energy-consuming sectors in Bhutan[3] are the building (residential, institutional and commercial), industry (especially cement, ferro-alloy and carbide industries) and transport sectors[4]. Over the last two decades, the construction sector in Bhutan, along with the hydropower sector, has witnessed exponential growth[5], but modern constructions continue to be largely ill-suited for the local environment. The lack of relevant smart designs, construction methods, and materials has created a current building stock with sub-standard indoor quality of life, as homes are uncomfortably cold during winter months, particularly at higher elevations. Such poor-quality homes drive up energy consumption, leading to significant economic, environmental, and social costs.

Reliance on hydropower

Currently, almost all of Bhutan's electricity requirements are met by hydropower resources. Hydropower electricity, while renewable, is not without environmental and social consequences. Dams and reservoirs are known to emit methane, a contributing greenhouse gas, and it will be important to consider these externalities when looking to the future of sustainable and environmentally conscious energy production in the country. In addition, hydropower generation potential could be compromised by shifts in hydrological regimes with a changing climate, including glacial melting and unpredictable monsoons. Although electricity access is now near-universal, rural dwellers remain reliant on fuelwood to meet some of their energy needs, placing pressure on forest resources. There are also periods in the winter, when river flow is low, when Bhutan has to import electricity from India to meet national requirements. Without development of other resources, such as solar and wind energy, and micro-hydropower, meeting primary energy requirements may remain challenging.

Worsening ambient air quality

Air pollution is an emerging national issue that will have implications on human as well as environmental health in Bhutan. The annual average

level of PM_{10} (particulate matter with a diameter of 2.5-10 micrometres or µm) has been increasing in Thimphu, and its levels have since 2009 consistently been higher than the standards set by the World Health Organization (WHO)[6]. During the dry winter season, the PM_{10} level in the capital routinely exceeds the allowable limits of the national standard of 60 micrograms per cubic metre (µg/m^3). There is a deteriorating trend in the level of PM_{10} over time, in Thimphu and other industrial areas, as well as the level of $PM_{2.5}$ (fine particulate matter with a diameter of under 2.5µm), which is even more harmful for health[7]. A global study found that localized air quality in Pasakha, with its smoky ferrosilicon and steel factories, was around 150 µg/m^3 of fine particle emissions[8] – higher than the notoriously smoggy climates of Delhi and Cairo.

Air pollution in Bhutan is caused by: exhaust emissions from diesel and petrol vehicles, industrial emissions, inorganic chemical and mining processing, wind-blown dust from unpaved roads, quarries and construction sites, forest fires, burning of household and farm waste, open fires at construction sites and roadside wood-fired heating of bitumen in open pans for road paving, and wood-burning stoves used for cooking and heating. There is also trans-boundary air pollution, with significant atmospheric brown haze in winter in Pasakha and the southern border areas. While there are strong laws and policies related to pollution-causing activities, their implementation has been a major challenge in-country, whilst trans-boundary pollution has not been tackled.

Indoor air pollution

The worst air pollution levels occur in the indoor environment in Bhutan's rural areas. As in many developing countries, rural communities rely on unprocessed biomass fuels (wood, cattle dung and crop residues) as the primary energy source for cooking and heating. When these solid fuels are burned in traditional stoves, high concentrations of harmful smoke and particles are generated. Air pollution emanating from fuels used for cooking and heating (including kerosene) has been termed "household air pollution (HAP)". Women and children generally spend more time indoors and are exposed to HAP daily, causing respiratory disease, lung cancer and heart disease. According to the 12th Five Year Plan, fuel wood still accounts for 21 % of total household energy consumption in Bhutan[9]. Although electrification is near universal, studies have shown that electrified houses use only 25% less firewood than non-electrified houses[10]. Interventions are needed to reduce exposure to HAP.

Expanding transport sector

Major sources of air pollutants are passenger cars and heavy-duty vehicles, including diesel-powered trucks and buses. A 2015 study showed that heavy-duty vehicles were responsible for at least 70% of local pollutants and nearly 60% of GHGs in the country[11]. The Road Safety and Transport Authority recorded 103,814 vehicles in the country (52% of them in Thimphu) as of June 30 2019, with vehicle ownership increasing at 15% per annum over the past few years[12]. An Asian Development Bank report suggests that emissions levels are likely to triple by 2030, if no action is taken, causing severe air pollution posing risks to people's health and environment, as well as a massive increase in carbon dioxide (CO_2) emissions[13]. Traffic congestion in also rising in Thimphu and Phuentsholing, causing loss of time and productivity, as well as resulting in air and noise pollution and traffic accidents. Efforts to widen roads and increase parking spaces have provided only limited relief. The lack of an efficient and comprehensive public transport systems encourages more people to use private transport, contributing to air pollution and greenhouse gas emissions.

Impacts of "dirty" industry

The other major sector causing both GHG emissions and air pollution, and impacting on the natural environment through other forms of pollution and resource extraction, is the growing industrial sector[14]. Many of Bhutan's industries depend on extraction of raw materials, such as

wood, stone and minerals, from the natural environment. Industrial activities also contribute to land degradation, through dumping of industrial waste, discharge of harmful effluents, and conversion of forest and agricultural lands for development of industrial estates. Energy intensive industries, the Cement, Ferrosilicon and Calcium carbide industries, emit a huge amount of carbon due to the use of fossil fuels in the manufacturing process, contributing to air pollution and greenhouse gas emissions.

Although legislation requires new industries to use only new and state-of-the-art machinery and technology, and ambient air quality standards are in place, this is not applied retroactively to older facilities which are often using obsolete technology. The country's industrial development plan envisages completing a network of industrial parks and special economic zones. Along with industrial development, there will be associated challenges of solid and liquid waste generation, effluents, sludge, air pollution, noise and fugitive emissions. There is also a need for better occupational health surveillance systems that focus on accident and disease prevention, and procedures for assessing factors that affect workers' health.

Challenges of climate change

In addition to the growing risk of forest fires (discussed above), landslides and floods (discussed in Chapter 2), Bhutan has witnessed more frequent and widespread windstorms and rainstorms in the recent past – believed to be triggered by climate change. Extreme weather events such as excessive precipitation and drought have impacted livelihoods in the past, while windstorms have affected almost all dzongkhags – blowing off roofs and damaging both public infrastructure and traditional houses in the villages. In 2009 Cyclone Aila, which originated in the Bay of Bengal, affected 17 districts and reported 12 lives lost with an estimated damage of Nu. 719 million. A severe windstorm in 2011 affected 17 districts and led to the loss of a life and damage to 2,424 houses, 57 schools, 77 lhakhangs, 4 block offices, 21 health centres, and 6 agricultural centres. A windstorm destroyed over 60 residential and public structures in Mongar and Trashigang in March 2019[15]. Poorer households tend to be affected worse, having less solid construction. The Royal Government of Bhutan views windstorm as an emerging high-risk hazard, given its intensity and frequency in recent years and the estimated damages and losses incurred in the housing and agriculture sector.

Based on existing policy, legislation, rules and regulations and guidelines, Bhutan's National Environment Strategy has the following air-related Strategic Objectives:

- *Strategic Objective #9*: Remain carbon neutral
- *Strategic Objective #10*: Improve ambient air quality
- *Strategic Objective #11*: Promote low-emission transport
- *Strategic Objective #12*: Adopt cleaner technology
- *Strategic Objective #13*: Develop renewable energy sector
- *Strategic Objective #14*: Improve energy efficiency
- *Strategic Objective #15*: Reduce household air pollution
- *Strategic Objective #16*: Provide early warning for windstorms

STRATEGIC OBJECTIVE 9: REMAIN CARBON NEUTRAL

	Document focus	Competent authorities
National Strategy and Action Plan for Low Carbon Development, 2012	Outlines options to manage emissions from energy-intensive industries, crop production, livestock raising, municipal solid waste, road transport, and residential sectors	National Environment Commission, Ministry of Economic Affairs
(Intended) Nationally Determined Contribution, 2015	Sets out an inclusive approach to climate-friendly investments and a diversified green energy mix that will deliver a carbon-neutral development framework	

Maintain forest carbon sink

The *Constitution of Bhutan* commits the country to maintaining a minimum of 60% of the total land surface under forest cover for all time, making an important contribution towards global mitigation of climate change. Subsequently in 2009, at the 15th Conference of Parties to the UN Framework Convention on Climate Change (UNFCCC) in Copenhagen, Bhutan issued a declaration titled, *Declaration of the Kingdom of Bhutan - The Land of Gross National Happiness to Save our Planet*, wherein we committed to "keep absorbing more carbon than we emit – and to maintain our country's status as a net sink for Green House Gasses" for all times. The commitment was reiterated in our first *Nationally Determined Contribution (NDC), 2015* towards the Paris Agreement, and the country has subsequently exceeded this target to become carbon negative, emitting less carbon-dioxide equivalent than it stores. This is largely due to huge areas of forest cover, low levels of industrial growth and high share of energy requirements met by non-fossil fuel-based hydropower. Continuing actions

include reporting to the UNFCCC on national emissions (in tonnes of CO2 equivalent) against national sequestration (709 million tonnes of CO2 equivalent in 2018[16]).

Plan low-carbon sectoral development

According to the *Economic Development Policy, 2016*, Bhutan's commitment to remain carbon neutral contributes to developing the "Brand Bhutan" theme, capitalizing on the opportunities arising from global trends towards low emission development, while at the same time "leapfrogging" towards global best practices in key sectors of the economy. Bhutan's draft climate change policy takes a sectoral approach to managing emissions of greenhouse gases such as carbon dioxide, methane and nitrous oxide. This builds on the *National Strategy and Action Plan for Low Carbon Development, 2012*, which sets out sectoral measures to manage emissions from the following economic sectors: (i) energy-intensive industries, (ii) crop production and livestock raising, (iii) municipal solid waste, (iv) road transport, and (v) residential. This was taken further in the *Emission Reduction Road Map and Strategy, 2015* which calls for mitigation actions in each sector. Specific actions for methane emissions include : in the agriculture sector, introducing improved cattle breeds and paddy cultivation methods; and in the waste sector, introducing mechanisms to collect and store methane gas at landfill sites. Other sectors (industry and transport) are discussed below.

STRATEGIC OBJECTIVE 10: IMPROVE AMBIENT AIR QUALITY

	Document focus	Competent authorities
National Environment Protection Act, 2007	Sets the overarching legal framework for environmental protection and management	National Environment Commission, Ministry of Health, Ministry of Economic Affairs, Ministry of Agriculture and Forests: Department of Forest and Park Services, Social Forestry Division, Territorial Division; Royal Bhutan Police; Ministry of Works and Human Settlements, Dzongkhag, Thromde and Gewog Administrations
Forest Fire Rule, 2012	Sets out roles of levels of government, and requirements for maintaining fire lines around infrastructure, permits for burning agricultural debris, and safety measures for economic activities	
Waste Prevention and Management Regulations, 2012 and revisions, 2016	Identifies roles for managing waste, including reducing burning of waste causing air pollution	

Address causes of pollution

In general, the ambient air quality in Bhutan has been considered excellent and clean. Nevertheless, this trend is changing with urbanization and industrial development, particularly in the main cities and industrial areas. The *National Environment Protection Act, 2007* (NEPA) sets the legal framework for environmental protection and management in Bhutan, with a number of laws addressing the causes of air pollution – such as the *Environmental Assessment Act, 2000* (for control of development activities, including factories, construction and blacktopping), *Waste Prevention and Management Act, 2009* (for management of wastes and construction debris, prevention of illegal solid waste burning), *Forest Fire Rule, 2012* (to prevent uncontrolled fires), *National Human Settlements Strategy, 2017* (to enhance green spaces and reduce dust), and *Local Government Act of Bhutan, 2009* (for activities within municipal boundaries and local jurisdictions). All vehicles are required to undergo annual emission tests, and promotion of electric vehicles and better public transport also aims to reduce air pollution. Other measures include promotion of smokeless stoves and subsidized electricity, especially for domestic consumption. A new national climate change policy (in draft form in 2019) will also highlight actions to address many of the causes of air pollution.

Reduce pollution from fires

Fires are a significant contributor to air pollution in the dry season – with wood-burning stoves used for heating as well as cooking in the winter, and fires at construction sites. Burning of household and farm waste can get out of control, causing major forest fires. According to the Department of Forest and Park Services, 239 incidents of forest fires affecting 19,231 hectares were reported between 2008-13. 2018 witnessed a total of 39 fire incidents with highest number detected in Wangdue Phodrang Dzongkhag, and largest area burnt in Mongar Dzongkhag (1,199

ha)[17]. Bhutan's holistic and integrated forest fire management strategy includes controlled fire use where appropriate, with advocacy and awareness to inform citizens on how to avoid accidentally starting forest fires, and how to burn agricultural residues and other waste safely. Actions include strong enforcement of penalties for illegal burning of waste and for causing forest fires.

Improve air quality monitoring

Automatic stations to monitor air quality are being installed at strategic locations in the country to ensure that emissions and discharges from industries comply with the national environmental standards. Ambient air quality standards are assessed from three areas – industrial area, mixed area (where residential, commercial or both activities take place), and sensitive area (where sensitive targets are in place like hospitals, schools, and sensitive ecosystems). Continued expansion and strengthening of the monitoring and data management system is critical, including improved monitoring of health impacts. This includes monitoring three sizes of particulate matter – coarse, or PM_{10} (diameter of 2.5-10 micrometres or µm), fine or $PM_{2.5}$ (diameter of 0.1-2.5 µm) and ultra-fine, or $PM_{0.1}$ (diameter of less than 0.1 µm). Specific PM_{10} targets for Thimphu and Pasakha have been included in the *12th Five Year Plan, 2018-2023*, aiming to keep the PM_{10} level below 60 micrograms/m^2 for Thimphu and 120 micrograms/m^2 for Pasakha. Actions are needed to set or revise environmental standards for other pollutants, and to monitor both point-source and fugitive emissions more comprehensively nationwide, with at least one station per Dzongkhag.

STRATEGIC OBJECTIVE 11: PROMOTE LOW-EMISSION TRANSPORT

	Document focus	Competent authorities
National Strategy and Action Plan for Low Carbon Development, 2012	Demonstrates potential for emission reductions in transport sector with multiple cumulative benefits	Ministry of Health; Ministry of Works and Human Settlement; Ministry of Economic Affairs; Ministry of Information & Communication: Road Safety and Transport Authority; Dzongkhag, and Thromde Administrations
Bhutan's Economic Development Policy, 2016	Sets out policies for development of low carbon transport sector in the country	

Monitor environmental impact of transport sector

Bhutan's *Draft National Transport Policy, 2017* builds on the *Bhutan Transport 2040 Integrated Strategic Vision, 2013*[18] and sets out a vision to provide the entire population with a safe, reliable, affordable, convenient, cost-effective, and environment-friendly transport system. The transport sector is the biggest single contributor to both air pollution in cities, and to national greenhouse gas emissions in Bhutan. The major sources of air pollutants are passenger cars and heavy-duty vehicles including diesel-powered, large and medium sized trucks and buses. The *National Strategy and Action Plan for Low Carbon Development, 2012* refers to the huge potential of the transport sector for greenhouse gas emission reductions, and Bhutan's *Nationally Determined Contribution* towards the Paris Agreement, 2015, sets out the country's approaches to promoting a low-carbon transport system. Sectoral emissions can be reduced through introducing cleaner vehicles and fuel, through replacing private cars with public transport, and enforcing vehicle emissions standards. Actions include ongoing improvement of urban air quality monitoring systems, and GHG emissions tracking.

Improve public transport

Improving public transport can help reduce air pollution and GHG emissions in two ways – through reducing the need for private cars, and through introducing new, cleaner vehicles, e.g. electric buses. In committing to improving public transport, the *Draft National Transport Policy, 2017* builds on Bhutan's *Economic Development Policy, 2016* which highlights the need for clean, safe, affordable and reliable mass transportation. Starting with the major cities, the policy promotes efficient bus services or other mass transit systems, and associated interventions to reduce congestion and vehicular emission. The policy commits to exploring electric/hybrid public transport systems in major urban centres, cooperating with the private sector. Thimphu and Phuntsholing Thromdes have improved bus stops, rehabilitated sidewalks and constructed footbridges. International partnerships will have enabled the cities to procure electric buses, convert taxis to electric taxis and establish quick-charging stations, and actions are needed to expand these initiatives on urgent basis.

Tighten vehicle emission controls

All vehicles are required to undergo annual emission tests, but this has rarely led to non-compliant vehicles being taken off the road. The *Bhutan Transport 2040 Integrated Strategic Vision, 2013* highlights the importance of tighter vehicle emission standards and enforcement to reduce air pollutants. In line with this strategy the NEC with international technical and financial support developed a policy brief[19] recommending an increase from the current Euro 2 emission standard to Euro 4, and eventually Euro 6, in line with India's standards. Improvements to the vehicle emission inspection system would ensure that vehicles on the road remain compliant with the original emission standards for which they were certified. Actions include strengthening Bhutan's vehicle inspection system, and improving testing procedures. This will encourage regular vehicle maintenance, and to identifying high emitters, obliging them to carry out repairs that would restore the vehicles' capacity to conform to the standards.

Use legal and fiscal instruments

Using legal and fiscal incentives to promote cleaner technology – both low-carbon vehicles and cleaner fuels – is highlighted in the *Bhutan Transport 2040 Integrated Strategic Vision, 2013*. Hybrid, plug-in hybrid, and electric cars emit low CO_2 throughout their lifespan, compared to diesel and gasoline powered vehicles. Actions include providing incentives for and reducing taxes on low-carbon vehicles. In addition to the earlier ban on import of used cars, duties have recently been increased on import of vehicles, restrictions have been placed on the introduction of new taxis. Import of low-sulphur fuels is also highlighted. Bhutan has already renegotiated with India on the sulphur content of imported fuel. Further actions could include issuing a regulation that requires all fuels imported from India to comply with the originating country's fuel standards, continuing testing fuel quality to help ensure compliance, and upgrading fuel quality testing procedures.

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STRATEGIC OBJECTIVE 12: ADOPT CLEANER TECHNOLOGY

	Document focus	Competent authorities
Environmental Assessment Act, 2000	Legislation, regulations and guidelines for environmental assessment, including sectoral guidelines for Forestry, Hydropower, Mines, Tourism, Highways and Roads, Transmission Lines, Urban Development, Industry	National Environment Commission; Ministry of Economic Affairs: Departments of Energy, Geology and Mines, Industry, and Trade; Ministry of Works and Human Settlement, Ministry of Agriculture and Forests; and Dzongkhag environmental committees
Regulation on Environmental Clearance of Projects, 2002		
Sector Environmental Assessment Guidelines		
General Rules and Regulations on Occupational Health and Safety in Construction, Manufacturing, Mining and Service Industries, 2006	Sets out specific regulations that aim to assure safe and healthy working conditions	Ministry of Labour and Human Resources

Enforce requirement for environmental approvals

Bhutan has a comprehensive approach to requiring EIAs and clearances for a wide range of economic activities related to tourism, urban development, hydropower, transmission lines, forestry, mines, industrial projects, and highways and roads. These address impacts on air quality, as well as solid and liquid waste and impacts on resource extraction. Full EIAs are required for hydropower projects, projects within protected areas and cultural heritage sites, large-scale mines and quarries, and mega projects (e.g. high-tension transmission lines, industrial estates, national highways). The *Regulation for Environmental Clearance of Projects, 2016* defines in detail the responsibilities and procedures for the implementation of the *Environmental Assessment Act, 2000*, concerning the issuance and enforcement of environmental clearances for individual projects. The *Waste Prevention and Management Regulation, 2012*, stipulates specific procedures for the management of medical, municipal, industrial, and electronic waste. Regular annual compliance monitoring of industries is being carried out, however, fines for infringement remain relatively low, and actions are needed to strengthen enforcement.

Promote investment in clean technology

The *Nationally Determined Contribution, 2015*, in terms of the Paris Agreement, commits Bhutan to promote a green and self-reliant economy towards carbon neutral and sustainable development through: (i) improvement of manufacturing processes through investments in cleaner technology, energy efficiency and environmental management; (ii) promoting industrial estate development and management in line with efficient, clean and green objectives (iii) enhancing and strengthening the environmental compliance monitoring system; and (iv) promoting in-

vestment in new industries at higher levels in the value chain, including green industries and services. International partnerships have enabled demonstration projects in cleaner, more efficient brick kiln technology, and actions include ongoing investigations into fiscal incentives for clean technology and environmental management. A five-year program through the Royal University of Bhutan, sets out to "Enhance research, innovation and scholarship" through improvement in research infrastructure, facilities and services, and a new national policy on science, technology and innovation.

Encourage sustainable consumption

Bhutan's *Consumer Protection Act of Bhutan, 2012*, sets out the rights and responsibilities of consumers in relation to sustainable consumption, placing positive pressure on industry to improve their environmental performance – in relation to emissions and air pollution, energy consumption, as well as effluent and water pollution, and recycling. The Office of Consumer Protection encourages sustainable consumption by disseminating information on the environmental impacts of consumer goods industry. In terms of the Act, consumers have a responsibility to consider the impact of their consumption patterns on the environment, in order to help to maintain the ecological balance. This in turn means an obligation by industry to disclose the impacts of their products' manufacture, use and disposal, in order to support informed consumer choices. Manufacturers and suppliers must also disclose information on the expected lifespan of goods, and must make good on their "implied guarantee" to provide for repair of goods and supply of spare parts – important in avoiding unnecessary production and consumption, with concomitant resource use and pollution impacts. Actions being taken involve international partnerships on Sustainable Consumption and Production, and activities to promote consumer awareness and education across Bhutan.

STRATEGIC OBJECTIVE 13: DEVELOP RENEWABLE ENERGY SECTOR

	Document focus	Competent authorities
Bhutan Sustainable Hydropower development Policy, 2008	Recognized need to move beyond dependence on renewable hydropower to a mix of renewable energy sources	Ministry of Economic Affairs
Economic Development Policy, 2010	Recognized need for an alternative renewable energy policy to promote RE resources	Ministry of Economic Affairs
Bhutan Renewable Energy Policy, 2011	Identified long-term and short-term objectives to broaden the energy mix by harnessing clean renewable energy sources	Ministry of Economic Affairs: Department of Renewable Energy
Alternative Renewable Energy Policy, 2013	Sets out plan to promote small-scale solar and hydropower, including off-grid systems	Ministry of Economic Affairs: Department of Renewable Energy

Diversify renewable sector

With rising demand for electricity and Bhutan's reliance on hydropower generation, the Department of Renewable Energy aims to broaden the energy supply mix by exploring other forms of clean and renewable energy sources. This will supplement hydropower generation, which is vulnerable to climate change impacts, and address the electricity shortage regularly faced during the dry season. Bhutan's *Alternative Renewable Energy Policy, 2013* aims to promote alternative sources including solar power plants (photovoltaic and thermal), small-scale hydropower[20], geothermal plants, wind turbines and windmills, biomass and biogas plants. Bhutan has established a preliminary minimum goal of


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20 megawatts (MW) of renewable energy product by 2025, through a mix of renewable energy technologies[21]. Actions include conducting research and development with an objective to make the technologies appropriate, affordable and cost-competitive in future.

Ensure energy access for remote communities

The development of off-grid systems to reach remote mountain communities has been prioritized in a number of five-year plans, including training for communities in installation and repair of such systems. Wind turbines are being rolled out in some dzongkhags, but this is done cautiously, mindful of the noise impact on neighbouring communities' happiness and well-being. Alternative fuels for cooking stoves are also being trialled with communities, including use of biomass from cattle waste, and smokeless stoves using pellets made from wood waste. A key ongoing action is to develop Decentralised Distributed Generation (DDG) projects[22] for provision of energy-based services to remote and dispersed villages, which are not electrified or not connected to the grid, through solar thermal, solar photovoltaic and other stand-alone systems.

STRATEGIC OBJECTIVE 14: IMPROVE ENERGY EFFICIENCY

	Document focus	Competent authorities
National Energy Efficiency & Conservation Policy, 2019	helps govern demand side of energy management and guides implementation of energy efficiency and conservation measures in building, industry, transport and household appliances	Department of Renewable Energy, Ministry of Economic Affairs; National Environmental Commission, National Housing Development Corporation Limited, Dzongkhag, Thromde and Gewog Administrations
Energy Efficiency Roadmap, 2018	sets out interventions required to achieve national energy-saving targets in building appliance and industry sectors	

Increase efficiency to reduce emissions

As per Bhutan's *Nationally Determined Contribution (NDC), 2015* towards the Paris Agreement, the country intends to remain carbon neutral, not only through maintaining current levels of forest cover, but also through pursuing low-emission development pathways across energy-consuming sectors – through promotion of energy demand side management. The importance of Energy Efficiency and Conservation (EE&C) measures is reflected in the *National Energy Efficiency & Conservation Policy, 2017* (formally launched in 2019), which aims to save at least 155 kilowatts of electricity in a year, and reduce imports of fossil fuels[23]. Bhutan's *Energy Efficiency Roadmap, 2018*, developed by the Department of Renewable Energy, establishes the impact of energy efficiency on country's GHG emissions, in line with the country's NDC targets, with about 0.59 Million tCO_2e emission reduction potential from implementation of EE&C measures[24].

Achieve sectoral targets for savings

The *Energy Efficiency Roadmap, 2018* elaborates the key interventions required to achieve the country's energy-saving target of 0.206 million tons of oil equivalent for 15 years[25]. Interventions are organized sector-wise and over three time horizons; short term (0-5 years), medium term (6-10 years) and long term (>10 years) for three sectors: building sector, appliance sector, and industry sector (production and manufacturing). Detailed actions are outlined for each of these energy-consuming sectors, based on recommendations from several studies[26] to guide implementation of the EE&C Policy and integration into the five year planning cycle. Actions include carrying out energy audits of energy-intensive industries, to examine where and how energy consumption can be reduced with marginal or moderate financial investments; and an Energy Endowment to provide low interest loans for energy-efficient construction and industry.

Promote sustainable construction

To achieve a future where a majority of buildings, towns, and cities in Bhutan are energy-efficient, the Royal Government of Bhutan aims to kick-start a Sustainable Building Initiative, bringing stakeholders together in a centre for innovation,

advocacy and capacity building. An energy audit will be carried out on all major public buildings, followed by a retrofitting plan, and the National Housing Development Corporation and Ministries will be encouraged to use green designs and insulation materials for the new towns. Actions include the development of capacity, networks and knowledge-sharing mechanisms, and, innovation and technology. Enhancement will be encouraged throughout the construction supply chain, with updated information on construction and insulation technologies, best practices, materials, and suppliers.

STRATEGIC OBJECTIVE 15: REDUCE HOUSEHOLD AIR POLLUTION

	Document focus	Competent authorities
National Environment Protection Act, 2007	Sets the overarching legal framework for environmental protection and management	Ministry of Health; Department of Renewable Energy; Ministry of Economic Affairs; National Environment Commission; Ministry of Agriculture and Forests; Dzongkhag, Thromde and Gewog Administrations

Implement pollution abatement

Bhutan's rural communities rely on coal and unprocessed biomass fuels (wood, cattle dung and crop residues) as the primary energy source for cooking and heating. When these solid fuels are burned in traditional stoves, high concentrations of harmful smoke and particles are generated, termed "household air pollution" (HAP). One study in Bhutan found household air with a concentration of ultra-fine particles (particulate matter or PM of less than 0.1 µm), during cooking time – comparable to typical concentrations from traffic inside road tunnels[27]. Women and children generally spend more time indoors and are exposed to HAP daily, causing respiratory disease, lung cancer and heart disease. The National Environment Commission's policy objectives include ensuring that adequate pollution abatement techniques and environmental management systems are in place. Indoor air pollution is currently not specifically regulated by law in Bhutan, but technologies are being disseminated to reduce this problem.

Roll out improved cookstoves

Through an international partnership, the Departments of Renewable Energy and Forests and Park Services are implementing a sustainable rural biomass program to roll out energy-efficient cookstoves. Dzongkhag and Gewog level awareness efforts are using networks of non-formal educators and women entrepreneurs to train households – who construct their own stoves, with the government subsidizing the metal components. Improved stoves produce less smoke and have proper chimneys, reducing levels of indoor pollution significantly. Actions are being taken to replicate these and similar technologies across Bhutan.

Switch to cleaner fuels

Actions also include the Royal Government of Bhutan subsidy for liquid petroleum gas (LPG), and actions to promote LPG as a cleaner option than firewood and other solid fuels. Bhutan imports 700 metric tonnes of LPG from India every month and provides this at a subsidized rate. In 2019 this was augmented by a further of


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1,000 metric tonnes of non-subsidized LPG, but uptake of this has been limited, while shortages of subsidized gas have been experienced[28]. The growing demand for subsidized gas, especially in larger towns, indicates a growing adoption of this technology for household use. However, challenges of accessibility and affordability remain, and in rural communities, shifting to clean fuels as a primary energy source will remain a challenge – given the prevalence of customary intensive cooking practices, such as liquor distillation and cattle feed preparation.

STRATEGIC OBJECTIVE 16: PROVIDE EARLY WARNING FOR WINDSTORMS

	Document focus	Competent authorities
Disaster Management Act of Bhutan, 2013	Strengthens institutions for mainstreaming risk reduction, and coordinated disaster management with community participation	Disaster Management Office, Department of Local Governance, Ministry of Home and Cultural Affairs; Royal Insurance Corporation of Bhutan; National Environment Commission, Ministry of Economic Affairs
Disaster Risk Management Strategy: "Safe, Resilient and Happy Bhutan", 2015	Provides guidance on Disaster Risk Management, roles for agencies and stakeholders and links to Climate Change Adaptation and sustainable development	

Manage increased windstorm risk


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Windstorms are amongst the set of natural disasters that are anticipated to become more frequent and severe as a result of climate change. Windstorms are already common in Bhutan, resulting in injury by fallen trees and blown-off roofs, uprooting of power cables, damage to homes and other buildings, and loss of crops and livestock. Thousands of households in more than 20 districts of the country have been affected by windstorm damage over the past decade[29]. The *Bhutan Disaster Risk Management Status Review, 2014* was carried, concluded that it is imperative that this emerging high-risk hazard is included in future multi-hazard risk assessments and mapping, making resources available to carry out technical research and plotting of windstorm events. A five-year program through the Ministry of Works and Human Settlements seeks to "Pursue green growth in construction sector", by improving the quality of infrastructure and promoting green and disaster-resilient construction technologies by professionalising the construction sector.

Respond to windstorm disasters

Bhutan's Disaster Management Strategy allows for responses to windstorm damage – providing those affected with tents for temporary shelter, and assistance with rebuilding homes and Gewog structures. Immediate post-disaster relief efforts are provided through Dzongkhag Disaster Offices and sometimes through the deployment of the armed forces, supported by Dee-suups (mili-

tia volunteers). The Royal Government of Bhutan provides compensation for windstorm damage through the Royal Insurance Corporation of Bhutan[30], to enable destroyed or damaged homes to be rebuilt. Actions to build stronger structures in areas prone to windstorms could lower compensation claims resulting from damage, and reduce overall costs in the long term.

Provide early warning of storms

A network of real-time automated weather monitoring and forecasting stations is being established, as part of Bhutan's adaptation to anticipated impacts of climate change, with increased intensity and frequency of disasters. This includes warnings that extreme weather is anticipated, including impending windstorms. Public awareness will be promoted, with emergency preparedness plans for communities likely to be affected, including evacuation where necessary. A five-year program is being implemented through the National Centre for Hydrology and Meteorology on "Hydrology, cryosphere and water resources information and early warning services", aiming to strengthen institutional capacity including, infrastructure for regular monitoring, risk assessment and an early warning system, to minimize the impacts of natural disasters intensified by climate change.

Implementation Plan

Strategic Objectives	Lead Agency	Collaborating Agencies
SO9: Remain carbon neutral	NEC	MoAF, MoIC, MoWHS, MoH, MoEA, ABI, BCCI, AWBI, LGs, MoE
SO10: Improve ambient air quality	NEC	MoEA, ABI, BCCI, MoH, Industries under DHI
SO11: Promote low-emission transport	NEC & MoIC	LGs, MoE
SO12: Adopt cleaner technology	NEC	MoEA, ABI, BCCI, MoIC, MoH, Industries under DHI, MoE
SO13: Develop the renewable energy sector	MoEA	NEC
SO14: Improve energy efficiency	MoHCA & NCHM	NEC, LGs
	MoEA	MoWHS, TCB, LGs, NEC
SO15: Reduce household air pollution	MOE and NEC	MOWHS, LGs, MOH
SO16: Provide early warning for windstorms	MoHCA & NCHM	NEC, LGs

Endnotes

[1] Forests capture and store large amounts of carbon, as well as helping regulate the climate, and maintaining forest cover is vital for the Himalayan region and the world.

[2] "Bhutan launches national policy for energy efficiency, conservation" - www.xinhuanet.com

[3] In 2014, the country consumed around 650,220 Tonnes of Oil Equivalent (ToE) of energy – DNR, 2017

[4] As per government record, the building sector in Bhutan contributed 42% of the total energy consumption in 2014, while the industry sector consumed 37%. The transport sector consumed 19% of the total energy –

Bhutan EDD 2015, *Bhutan Building Energy Efficiency*, *Industry Audit Report*, *Appliances Audit Report*, *Technical Specifications for Energy Efficient Appliances*

[5] As of 2017, the construction sector employed over 3,866 contractors, generated 15.87% of Bhutan's GDP, and employed 3.2% of the labour force – DNR, 2017

[6] World Health Organization, 2016, Global Urban Ambient Air Pollution Database

[7] WHO, 2016

[8] WHO, 2016

[9] Gross National Happiness Commission, 12th Five Year Plan 2018-2013, page 51

[10] Department of Energy. 2005. Bhutan Energy Data Directory 2005. Thimphu: Ministry of Economic Affairs, Royal Government of Bhutan

[11] ADB 2019 policy brief "Bhutan Vehicle Emission Reduction Road Map and Strategy, 2017–2025"- according to the Road Safety and Transport Authority in June 2015, HDVs accounted for 73% of the total number of vehicles in the country based on and were responsible for about 70% to 90% of local pollutants and nearly 60% of GHGs in the country.

[12] Road Safety and Transport Authority, www.rsta.gov.bt

[13] Based on current trends of vehicle acquisition and fuel import standards, and without any policy interventions, vehicle inventory in the country could increase to 180,000 units by 2030. With this, emissions from the domestic transport sector could reach 660,000 tons of carbon dioxide equivalent (tCO2 e) in 2030 - Asian Development Bank, 2017.*Bhutan Vehicle Emission Reduction Road Map and Strategy, 2017–2025*

[14] Between 2006-12, the number of forest-based industries increased from 470 to 954 and the mineral based industries increased from 91 to 236 in the country – www.xinhuanet.com

[15] www.kuenselonline.com

[16] Forest Resources Management Division, 2018. National Forest Inventory Report Stocktaking Nation's Forest Resources Volume II Department of Forest and Park Services, Ministry of Agriculture and Forests, Royal Government of Bhutan - According to the National Forest Inventory, Bhutan's forests currently store 709 million tonnes of carbon in the form of biomass carbon and soil organic carbon.

[17] Department of Forest and Park Services, *2018 Forest Facts and Figures*

[18] Asian Development Bank, 2013. *Bhutan Transport 2040 Integrated Strategic Vision*

[19] ADB 2019 policy brief "Bhutan Vehicle Emission Reduction Road Map and Strategy, 2017–2025"

[20] Defined as hydropower projects up to 25 MW.

[21] Ministry of Economic Affairs, 2013. *Alternative Renewable Energy Policy.* This includes electricity generation a) Solar – 5 MW, b) Wind – 5 MW, and c) Biomass – 5 MW; and energy generation a) Biomass Energy System - 3 MW equivalent, and b) Solar Thermal System - 3 MW equivalent

[22] In terms of the policy, such projects qualify for an additional five years income tax holiday – for project developers, manufacturers and system integrators of RE projects established in the remote areas of the Kingdom as notified by the NA based on poverty levels and other strategic reasons

[23] Department of Renewable Energy, Ministry of Economic Affairs, 2017. *National Energy Efficiency & Conservation Policy*

[24] Department of Renewable Energy, Ministry of Economic Affairs, 2018. *Energy Efficiency Roadmap*

[25] Department of Renewable Energy, Ministry of Economic Affairs, 2018. *Energy Efficiency Roadmap*

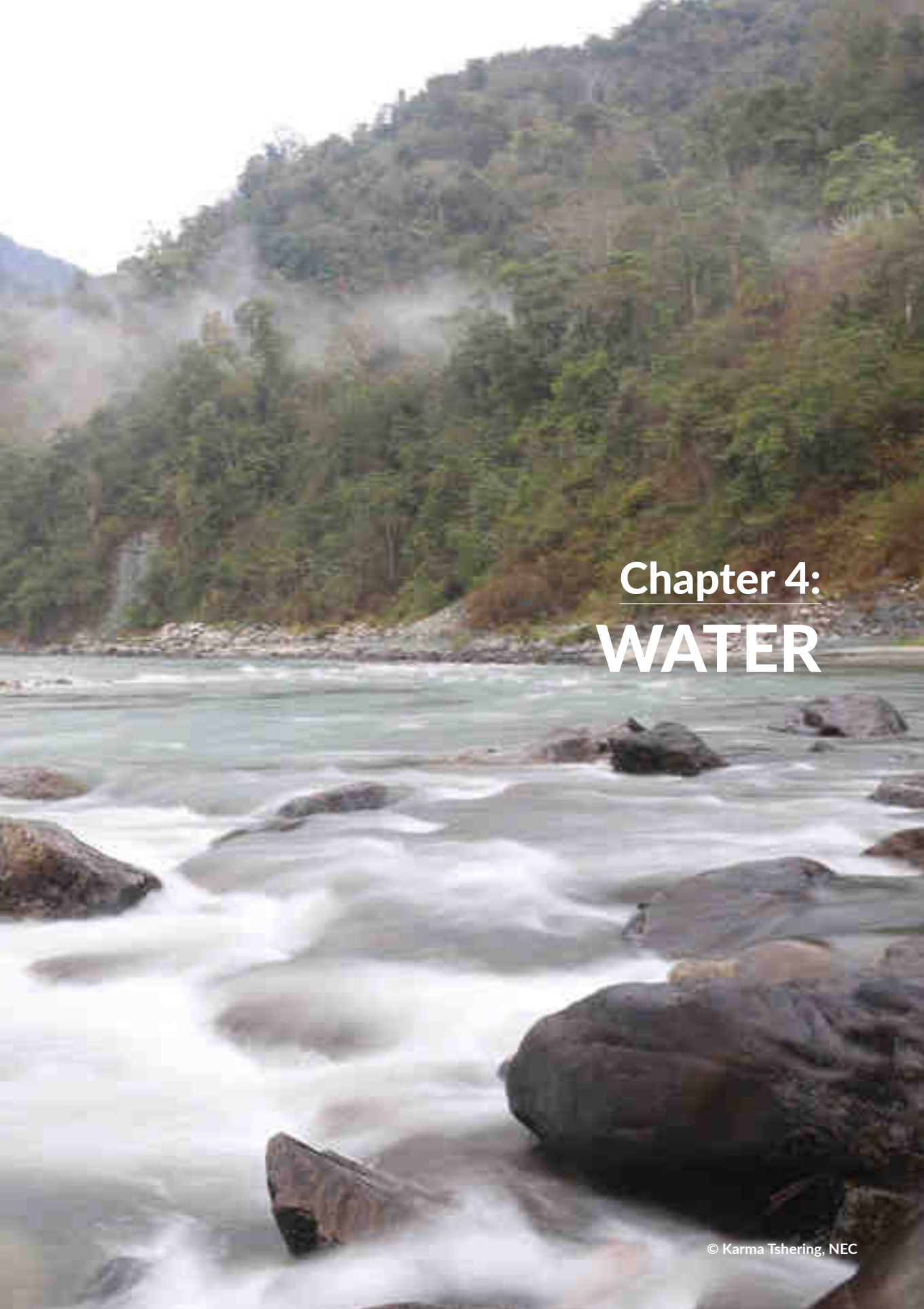
[26] Bhutan EDD 2015, *Bhutan Building Energy Efficiency, Industry Audit Report, Appliances Audit Report, Technical Specifications for Energy Efficient Appliances*

[27] Wangchuk, Tenzin et al., 2015. "Children's personal exposure to air pollution in rural villages in Bhutan". *Environmental Research* 140: 691-698

[28] Response by Minister of Economic Affairs, Loknath Sharma, to question in the National Assembly on 14 June 201p, www.theBhutanese.bt

[29] www.kuenselonline.com

[30] RICBL compensates up to a maximum Nu 30,000 per household. www.kuenselonline.com



Chapter 4:
WATER

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Bhutan has an abundance of water resources of good quality – from snow, glaciers, rivers, lakes, streams, springs, wetlands, rainwater, soil moisture and groundwater. Water has shaped the traditions and culture of the Bhutanese people, with centuries of communal water sharing and collective management practices. Water is important in traditional spiritual cleansing and ritual ceremonies, and the dwelling places of deities are often associated with water bodies[1]. The country's rich freshwater resource provides the foundation for life and for all economic activity, including the country's four major economic drivers of agriculture, hydropower, tourism and small-scale industry, as well as for therapeutic and religious purposes. Agriculture – which consumes over 90% of water resources – employs over half our population and contributes over 15% of the country's GDP. The energy sector in Bhutan, comprised almost wholly of hydropower, accounts for a fifth of the nation's GDP and, almost the same share of all revenue earned[2].

Although, Bhutan has high per capita water availability in theory, the mountainous terrain and deep gorges restrict water harvesting to small river tributaries, streams, springs and aquifers. These sources are vulnerable to seasonal variations in precipitation, exacerbated by climate change, and disturbances from human activities such as grazing, extraction of forest resources, and mining and quarrying. Changes in the hydrological cycle, such as lower winter flows in streams and intense monsoons, may cause both flooding and localized water shortages, and affect irrigation and drinking water as well as hydropower generation. Increasing urbanization and population pressures in cities have also started affecting water quality, with growing concerns about water pollution. This section explores these water-related challenges, to which the National Environment Strategy responds.

Challenges related to water quality

National Environment Commission surveys and monitoring indicate that Bhutan's water resources are healthy at the macro level, but there is an increasing concern that population growth and fast urbanization are outpacing the installation of sewerage treatment and solid waste collection, threatening the water quality, especially in areas downstream of towns and cities. Localized pollution of rivers, lakes and groundwater occurs from municipal wastewater, improper disposal of waste, discharge of industrial effluents, mining and road construction. Increasing sediment loads in the rivers and streams, as a result of developmental activities, is impacting negatively on aquatic biodiversity[3]. The impact of agro-chemicals and fertilizers are on land and water resources has not been systematically assessed.

Though some major towns in Bhutan have sewerage treatment plants, other small towns and rural household use individual septic tanks and pit toilets to treat sewage. Less than 20% of total households in Thimphu[4] are connected to the sewer system and the rest rely on individual septic tanks emptied by a vacuum tanker. Domestic sewage, uncontrolled seepage, or overflows from septic tanks are some of the main sources of water pollution. Thimphu's sewer system is connected directly into the river, and leachate from the waste landfill in Memelakha also seeps into the Olarong Chhu. In addition to sewage (black water), discharging grey water directly into the stormwater drains is also of concern, as it pollutes the river downstream, and stormwa-


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ter is not treated. Plastic waste in rivers is also increasing, as consumption patterns change and waste management services battle to keep up with growing urban populations. In towns where there are large concentrations of automobile workshops, the discharge of waste oil and other effluents is a significant source of water pollution.

Over 97% of Bhutanese people have access to improved drinking water, but water quality is not always safe for drinking. A civil society water quality monitoring program started in 2017 found that key rivers in Bhutan contained significant levels of E. Coli bacteria. Water with any amount of E. Coli bacteria (a direct indication of faecal contamination) is considered unsafe to drink. Unclean water has been traced to numerous diseases, such as cholera, fluorosis and typhoid fever. Diarrhoea, a preventable disease, is one of the most common diseases that many Bhutanese suffer from every year, with drinking water quality a key contributing factor. According to Royal Centre for Disease Control, of 5,740 samples that were tested in 2016 for thermo tolerant coliform only 44.3% were found to be safe for human consumption[5]. Before 2016, water providers had no obligations to conduct water testing and treatment. Now there is a system in place, but ongoing challenges are experienced in terms of human resources, equipment, funding and institutional linkages.

Challenges related to water availability and infrastructure

Despite high overall water availability per capita, Bhutan is confronted with localized and seasonal water shortages for drinking and agricultural purposes, which pose an obstacle to development. Drinking as well as irrigation water shortage is a growing challenge, especially during the dry winter months. Much water for domestic use and small-scale irrigation comes from springs and aquifers. In some areas these sub-surface sources have dried up because of increasing surface run off, caused by ecological degradation, and by changing monsoon patterns. Scientists


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estimate that by 2100, South Asian countries, including Bhutan, will experience a 5% decrease in rainfall during the dry season[6]. According to the *National Irrigation Master Plan, 2016*, of the total 105,682 acres of cultivated land, 64,248 acres still depends on the rain-fed traditional irrigation system[7]. Use of bore-wells is increasing, and the valleys of Paro, Punakha, Thimphu, Wangdue, and areas bordering the plains of India may have significant groundwater reserves, but these must be accessed cautiously to avoid risk of over extraction, contamination and land subsidence.

Bhutan has made considerable progress in terms of coverage for both rural and urban water supply and sanitation in the last three decades[8]. However, the functionality of the water supply infrastructure in both rural and urban areas needs improvement. In rural areas, the scattered nature of settlements means water treatment plants are not practical, and infrastructure is limited to water pipes, intake structures, water storage tanks and taps. According to the 2017 census, only about 81% of housing units have reliable water supply during the critical hours of the day (morning, noon and evening), and about 1.6% of households still need to travel for at least 30 minutes to the nearest water source[9]. Drying up of water sources has been reported in 19 communities, comprising 336 households[10]. Rural sanitation facilities consist predominantly of pit toilets, followed by pour flush toilet and

others. Urban sanitation relies on septic tanks, many without a soakpit, discharging effluent directly into the environment.

Challenges related to climate-intensified disasters

Bhutan's vulnerability to water-induced disasters is well known. The country's mountainous terrain makes for rapid surface runoff, and the rivers, running through deep gorges and ravines, receive huge volumes of water during the summer monsoon. As the climate changes, with more frequent cloudbursts, flash floods are likely to become increasingly common[11]. Serious flood events in recent years include the 2000 monsoon floods in Phuentsholing, which closed the highway to Thimphu for nearly a month, the 2004 eastern Bhutan monsoon floods, the 2009 floods induced by Cyclone Aila, and the 2016 southern Bhutan monsoon floods, in which Sarpang town was completely washed away. Floods also cause loss of soil fertility – with erosion of topsoil, landslides and formation of rills and gullies, as well as seepage of nutrients from waterlogged fields. The landslide on the Tsatichu River in 2003 demonstrated the vulnerability of the hydropower sector, creating a new lake that could pose dangers to the downstream Kurichu Hydropower station.

As mean temperatures increase with climate change, Bhutan's 677 glaciers are melting and retreating[12], leaving behind growing reservoirs of water which can burst, releasing millions of cubic metres of water in flash floods, with landslides, siltation of rivers, and damage to hydropower infrastructure[13]. These events of Glacial Lake Outburst Flooding (GLOF) have increased in frequency in the last 50 years. There were 21 GLOF events recorded in Bhutan over the past 200 years, with five events in the last 40 years. The most catastrophic event was in 1994, when Luggye Tsho (Lake) in eastern Lunana burst, generating floodwaters of 2 metres in height over a distance of 200 km. The flood resulted in 20 lives being lost, yaks and food grain washed away, and damage to houses, watermills, bridges and fields.


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This was followed by Dig Tsho GLOF in 1998, and western Zyndan GLOF in 2008. A major GLOF event occurred in 2015 with the collapse of the Lemthang Tsho, a source of the Mochu river, which also affected water supply to agricultural communities in the valley.

Challenges related to hydropower

The hydropower sector is the backbone of the Bhutanese economy, catering to 72% of industrial energy needs and 34.3% of residential energy needs[14]. Hydropower is also the nation's biggest source of revenue, enabling the great strides of recent decades in improving service delivery and living standards. The rugged mountainous terrain, swift-flowing rivers fed by the many glaciers and glacial lakes and monsoon rains, and well-preserved watersheds have blessed the country with tremendous hydropower resources – with an estimated total potential of 30,000 MW from 70 river-based sites and six reservoirs, with about 24,000 MW of this being technically feasible. Hydropower provides a clean and renewable source of energy that helps Bhutan retain low levels of emission of greenhouse gases. According to the 12th Five Year Plan, 2018-2023, Bhutan's economy remains undiversified, and over-reliant on the hydropower sector, with a 30% share of the economy[15].

The hydropower sector is also vulnerable to climate change, with the most significant climate risk coming from glacial lake outburst flooding which can cause catastrophic failures of dams and hydropower infrastructure. With rapid melt-

ing of glaciers, river flows are likely to change, undermining the very basis on which the hydropower projects are being planned. Other major risks include unpredictable rainfall patterns, since all the current hydropower schemes do not have any storage capacity, the power generation fluctuates according to the seasonal and daily variation of discharge in rivers. Flow can also be impeded by increased sediment load in rivers as a result of landslides and flash floods triggered by heavy rains, decreasing the expected output and economic life of hydropower plants. Low river flows in the dry winter at the same time when there is surge in electricity usage for space heating, create seasonal electricity deficiencies and push government to import electricity.

Hydropower construction causes irreversible change to the natural landscape, and negative social and environmental impacts are caused by muck and debris, drilling and blasting. At present, hydropower plants are concentrated in the middle to lower parts of the basins and are primarily 'run-off-the-river' schemes, but many have some storage and long tunnels, diverting a significant part of the river's flow out of the river channel, and putting aquatic ecosystems under severe stress. Submergence due to pondage or reservoirs, flow alterations, blockage of fish migration paths due to dams, rivers drying up below dams as water is diverted, impacts of tunnelling on natural springs, debris disposal, impacts of operating turbines for generating peaking power which will lead to extreme flow and water level fluctuations – all these are likely to impact aquatic ecosystems badly. Massive expansion of hydropower would destroy the pristine river valleys, the rich biodiversity and the beauty of the region on which tourism depends.

Historically, the multiple institutions governing water use in Bhutan have had weak functional linkages at policy, planning and programming levels, leading to duplication of efforts, weak coordination and dispersed accountability. Developing capacity to manage water resources sustainably, following an integrated water resource management approach, is essential for balancing the needs of conservation with those of development.


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Based on existing policy, legislation, rules and regulations and guidelines, Bhutan's National Environment Strategy has the following water-related Strategic Objectives:

- *Strategic Objective 17*: Institutionalize and implement integrated water resource management
- *Strategic Objective 18*: Prevent freshwater pollution
- *Strategic Objective 19*: Improve access to safe drinking water and sanitation
- *Strategic Objective 20*: Prevent damage from flood disasters
- *Strategic Objective 21*: Ensure sustainable development of hydropower
- *Strategic Objective 22*: Ensure efficient use of water resources.

STRATEGIC OBJECTIVE 17: INSTITUTIONALIZE AND IMPLEMENT INTEGRATED WATER RESOURCE MANAGEMENT

	Document focus	Competent authorities
Water Policy, 2003	Ensures that water is available in abundance to pursue socioeconomic development	National Environment Commission; Ministry of Works and Human Settlement; Ministry of Health; Ministry of Agriculture and Forests; Ministry of Home and Cultural Affairs; Ministry of Economic Affairs Ministry of Education; Bhutan Electricity Authority; Dzongkhag Water Management Committees
Water Act of Bhutan, 2011	Enshrines concept of integrated water resources management, and prioritizes management of water for drinking and sanitation, then for agriculture and hydro energy	
National Integrated Water Resource Management Plan, 2016	Establishes framework and priorities for implementation of integrated water resources management	

Strengthen and capacitate IWRM institutions

Bhutan's *2020 Vision* states that the effective management of watersheds must be considered a key component of our efforts to place the nation's development on a sustainable path, since water is a precious natural resource and a heritage important to all aspects of social, economic and environmental wellbeing. A key goal of the *Water Act of Bhutan, 2011* is to create the conditions for a shift from a fragmented approach to an integrated approach for the management of water resources, with decentralized water governance. As per the Act, River Basin Management Committees and Water Users' Associations are to be formed to ensure implementation of water plans and promote local capacity development and water security. WUAs can take actions to enhance water availability for household use, wetland paddy and irrigating vegetables, resolve disputes and ensure equitable distribution.

Improve integrated service delivery

Improvement in integrated water resource management and service delivery should be based on regular stakeholder consultations and coordination meetings, aiming to integrate programs, plans and policies of all sectors dealing with water. The *National Integrated Water Resource Management Plan, 2016* promotes inter-agency coordination for development, management, conservation and efficient use of water resources, including surface and groundwater resources. Integration and consolidation of the water supply and distribution network should also lessen instances of illegal tapping, water connection bypassing water meter, and diversion of water supply[16]. Agencies are collaborating on tracking the Bhutan Water Security Index (NECS to take the lead in integrating water information system lying with various agencies in order to have one integrated water information system at national

level to avoid duplication of resources) – a system for planning and monitoring the status of the water resources at basin and sub-basin/district-level scale. Key actions include the development of Integrated River Basin Management Plans, such as those which have been developed for Wang Chhu and Kulong Chhu, for all basins. Payments for Ecosystem Services can also be upscaled, building on successful cases, e.g. where a water association and hotel operators provide payments to a group of households managing an upstream watershed[17].

Manage water resources for a changing climate

Bhutan's *Nationally Determined Contribution (NDC), 2015* highlights the country's commitment to increase resilience to the impacts of climate change on water security through Integrated Water Resource Management approaches, including (i) water resource monitoring, assessment and mapping; (ii) adoption and diffusion of new, innovative and appropriate technologies for water harvesting and efficient use; (iii) climate proofing water distribution systems; and (iv) integrated watershed and wetland management. As part of NAPA implementation, plans include undertaking comprehensive surveys of water resources, building of scenarios, and study of indigenous and emerging interventions, to make the case for scaling-up adaptation. This includes action to undertake site-specific studies on potential for sustainable groundwater extraction, allowing for recharge and avoiding negative impacts on the water table. In implementing the *National Land Use Zoning Implementation Guidelines, 2018*, efforts will be made to protect and preserve watersheds, wetlands and forest ecosystems that are important for adaptation. Two relevant five -year programs implemented by the Ministry of Agriculture and Forests are: "Climate smart and disaster resilient development", to explore alternative water sources for continuous drinking and irrigation water; and "Sustainable natural resource management and utilisation", to undertake effective management of wetlands and watersheds for reliable water supply.

STRATEGIC OBJECTIVE 18: PREVENT FRESHWATER POLLUTION

	Document focus	Competent authorities
Water Act of Bhutan, 2011	Aims to protect water resources of Bhutan and manage them efficiently and sustainably	National Centre for Hydrology and Meteorology; Environment Unit, Department of Industries, Ministry of Economic Affairs; Royal Centre for Disease Control; Ministry of Health: Department of Public Health, Public Health Engineering, National Environment Commission; Ministry of Works and Human Settlement; National Water Reference Laboratory; Dzongkhag, Thromde and Gewog Administrations
Water Regulation of Bhutan, 2014	Regulates effluent wastewater/ discharge, to minimize pollution and ensure quality	
Water Quality Standards, 2018	Includes ambient water quality criteria, industrial effluent discharge standards and standards for sewerage effluent	

Strengthen enforcement of effluent discharge standards

In order to improve the quality of water in Bhutan's rivers, Government is committed to strengthen enforcement of the effluent discharge standards contained in the *Water Regulation of Bhutan, 2014*. These standards were further developed in the *Water Quality Standards, 2018*, which includes updated industrial effluent discharge standards and clarifies that the Environment Unit, Department of Industries, Ministry of Economic Affairs should conduct monitoring for listed projects, and ensure effluent discharge standards are complied with the industries, and that the National Environment Commission Secretariat should conduct verification monitoring of effluent discharges, and investigative monitoring in case of deterioration of the water quality. This includes taking actions to enforce the requirement for car-wash facilities to establish effluent treatment plants.

Improve sewerage treatment facilities

The *Water Quality Standards, 2018* clarifies the roles and responsibilities of Thromdes/Municipalities in conducting monitoring of effluent discharged from their sewage treatment plants, to ensure that discharges are within the prescribed standards. Government continues to expand and improve the coverage of sewerage treatment facilities, especially in urban areas, where this is an urgent need. In terms of the National Integrated Water Resource Management Plan, 2016, every Thromde and Dzongkhag Administration should prepare an Integrated Water Use Management Plan based on demographic projections for the next decade, to ensure efficient water supply and effluent disposal, including drainage systems, in its jurisdiction. This should include actions for treatment of leachate from waste landfill sites, as per the *Waste Prevention and Management Regulations, 2012*. International partnerships are also enabling the piloting of an energy-saving small-

scale sewage system and low-cost wastewater treatment plant in Thimphu.

Monitor drinking water quality

To comply with government policies, legislation and rules according to the Water Act of Bhutan, 2011, and the Water Regulation of Bhutan, 2014, the Ministry of Health was mandated to monitor drinking water quality in urban and rural areas, coordinated by the Royal Centre for Disease Control. The *Bhutan Drinking Water Quality Standard* was adopted in 2016 by the National Environment Commission to protect public health and improve water quality, setting safe concentrations of drinking water parameters, and supporting quality management (e.g. sampling, testing, reporting and documentation) by all service providers. An Urban Drinking Water Quality Monitoring System ensures monthly testing by district laboratories from 34 reporting centres including hospitals and basic health units, and a Rural Drinking Water Quality Monitoring System undertakes bi-annual testing in the wet and dry seasons. According to the latest Annual Drinking Water Quality Report[18], and key actions include training health-workers to monitor rural drinking water quality and enter data into an online water quality and monitoring information system.

Intensify urban clean-up campaigns

Under the leadership of the Her Majesty The Gyaltsuen Jetsun Pema Wangchuck, Clean Bhutan campaigns have been conducted in towns and villages, with 20 clean-up programs along the four rivers of Thimphu Chhu, Paro Chhu, Punakha Chhu (Po Chhu/Mo Chhu) and Chuba Chhu stream in Thimphu, and awareness is growing about the need to recycle plastic packaging. The National Environment Commission has also initiated a campaign, "My waste, my responsibility" which was launched by Her Majesty The Gyaltsuen in June 2019, through which Bhutan will observe on the second day of every month a "Zero Waste hour" to achieve its vision of a Zero Waste Society by 2030.

STRATEGIC OBJECTIVE 19: IMPROVE ACCESS TO SAFE DRINKING WATER AND SANITATION

	Document focus	Competent authorities
Water Policy, 2003	Ensures that water is available in abundance to pursue socioeconomic development	National Environment Commission; Ministry of Health; Ministry of Works and Human Settlements; Department of Forest and Park Services, Ministry of Agriculture and Forests – Department of Agriculture; Dzongkhag, Thromde and Gewog Administrations
National Integrated Water Resource Management Plan, 2016	Establishes framework and priorities for implementation of integrated water resources management	

Rejuvenate rural water sources

The Royal Government of Bhutan has identified lake and spring revival and watershed management as a priority in the *12th Five Year Plan, 2018-2023*, with activities being undertaken by the Watershed Management Division of the Department of Forest and Park Services. This aims to improve availability and accessibility of water, making communities more resilient to climate change. In some areas, areas around dried up lakes and springs have been revegetated with native species, or springs have been fenced off to protect against trampling by livestock, allowing them to recover. Actions are being taken to experiment with recharging spring-sheds through digging trenches and ponds to trap water in the monsoon and allow it to percolate into the ground. Preservation of traditional water sources can go along with maintaining cultural practices such as installation of Lubum at water sources.

Promote climate-resilient water harvesting, storage and distribution

Partnerships with CSOs/NGOs and donors have made possible the construction of climate-resilient water harvesting, storage and distribution systems in several Dzongkhags. At Gewog level, Water User Associations are taking action to improve water supply – introducing rainwater


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harvesting, renovating old irrigation channels, and constructing new storage and distribution systems. Members contribute to collective savings to protect water sources and maintain water distribution systems, increasing water availability for household uses, livestock and rice cultivation, improving hygiene and sanitation, and freeing up time for women and children. Water conservation actions are being combined with soil conservation to prevent erosion and enhance soil fertility, with Dzongkhag agricultural extension support to understand crop water and nutrient requirements. Bore-well use also needs to be investigated through scientific studies to assess where groundwater can be extracted sustainably.

Expand water and sanitation facilities

The Royal Government of Bhutan is committed to continuing the expansion of water and sanitation facilities in urban and rural areas throughout the country, as set out in the *Draft National Sanitation & Hygiene Policy, 2019*. A five-year program, 2018-2023, implemented by the Ministry of Works and Human Settlements on "Water, Sanitation and Hygiene (WASH)", aiming to provide access to 24x7 safe drinking water to both rural and urban households, to develop, monitor and evaluate water safety plans in both rural and urban areas. Actions will include improved water quality testing and surveillance, and support to Gewogs and water user associations to construct new water supply schemes, rehabilitate existing schemes and protect water sources. The program will also ensure adequate irrigation water, with the area of (Chhuzhing terraced paddy fields) monitored as a Key Performance Indicator in the 12th Five Year Plan. A five-year "Local Government program on community health enhancement and water security" will resource the provision of safe drinking water and pour flush toilets for the poorest households. By the end of the Plan period, it is expected that all households should have access to improved sanitation, as per the Key Performance Indicator. In order to ensure efficiency and reliability of water supply, creation of an agency for water supply services is being explored.

STRATEGIC OBJECTIVE 20: PREVENT DAMAGE FROM FLOOD DISASTERS

	Document focus	Competent authorities
National Adaptation Program of Action, 2006 (updated in 2012)	Sets out anticipated increased risk of GLOF events from global warming, and key adaptation strategies and priorities	National Environment Commission; Department of Geology and Mines, Ministry of Economic Affairs
Disaster Management Act of Bhutan, 2013	Strengthens institutions for mainstreaming risk reduction, and coordinated disaster management with community participation	National Disaster Management Authority National Centre for Hydrology and Meteorology; Department of Hydro Met Services, Ministry of Home and Cultural Affairs – Department of Disaster Management; National Weather Forecast and Flood Warning Centre; Ministry of Works and Human Settlement – Flood Engineering Management Division; Department of Medical Services, Ministry of Health; Disaster Management Office, Department of Local Governance; Ministry of Economic Affairs National Environment Commission
Disaster Management Rules and Regulations, 2014	Establishes coordination and facilitation mechanisms for international teams during response and relief operations	
Disaster Risk Management Strategy, 2017	Provides guidance on Disaster Risk Management, roles for agencies and stakeholders and links to Climate Change Adaptation and sustainable development	

Integrated approach to flood risk management

Building on the *Disaster Management Act of Bhutan, 2013*, the *Disaster Risk Management Strategy, 2017* includes composite risk assessment reports and hazard maps for Bhutan, with an integrated and coordinated approach to flood control and management. The Flood Engineering and Management Division under the Department of Engineering Services is responsible for planning, designing and implementing flood protection structures along flood-prone settlements, including agricultural fields. Key actions by the Division include carrying out flood risk assessment studies and implementing innovative construction technologies, including protecting riverbanks with gabions, reinforced cement concrete walls, Articulating Block Mattresses etc. A five-year program through the Ministry of Home and Cultural Affairs on "Enhancement of disaster risk reduction and management" will strengthen disaster preparedness, response and recovery capacity.

Extend flooding early warning systems

In terms of the *Disaster Risk Management Strategy, 2017*, Government is developing flood early warning systems along high-risk rivers, and building a robust national network of weather stations. Donor support has enabled capacity building with staff of the National Weather Forecast and Flood Warning Centre to provide weather and climate advisories. Most weather stations have been automated to provide near real-time information, and prediction models are being tested in high-risk river basins. The National Centre for Hydrology and Meteorology now has a 24/7 monitoring system in place, with staff trained in satellite rainfall estimation methods and flood prediction. Actions is being taken to establish flood forecasting and early warning systems with vulnerable communities, based on disaster management plans that include forecasting, prevention, evacuation and mitigating measures.

Prevent landslides from floodwaters

Recent years have seen increasing investment in the area of disaster risk reduction, with support from international partners, including landslide prevention work through slope stabilization and bioengineering, and constructing environmentally friendly roads, bridges and other infrastructure. Hazard mapping for landslides and stabilisation works are being carried out in flood-prone areas, using a combination of state-of-the art engineering solutions such as soil nailing and shot-creting, gabions walls, sand-bag check dams and bioengineering techniques. With flood and landslide protections in place, during the heavy monsoon season, communities can rest assured their lands are safe. Integrated river basin management and water user structures' disaster management plans also include action on watershed management – conserving forest cover, protecting riverbanks, and revegetating bare slopes.

Manage risks of glacial lakes

Important activities to adapt to GLOF threats highlighted in the *National Adaptation Program of Action, 2006* (updated in 2012) were: (i) installation of early warning systems with associated awareness raising (especially Punakha-Wangdi Valley); (ii) hazard zoning to prevent development of infrastructure in red zones (especially Chamkar Chhu basin); and (iii) assessment of GLOF threats for hydropower projects. Current strategic priorities include strengthening the monitoring of potentially dangerous glacial lakes and instituting a network of GLOF early warning systems covering all river basins and sub-basins at risk, building on the experience and capacity accrued from the development of pilot GLOF early warning system in Puna Tsang Chhu. Another vital action is the development of GLOF hazard mapping and zonation for all vulnerable river basins and sub-basins followed by sensitization with local communities, and establishment of early warning systems.

Artificially lower glacial lake levels

Cooperating with a number of partners, the Royal Government of Bhutan has worked to lower the level of water in high risk glacial lakes, including the Thorthormi Tsho and Raphstreng Tsho, to mitigate the immediate threat posed by these lakes outburst to the population in the Punakha-Wangdi and Chamkar valleys in central Bhutan. This is being done through controlled drainage – lowering the level of the lakes by bringing workers and equipment to great altitudes to excavate an artificial spillway, digging with shovels to widening the existing outlet channel. This requires detailed geographical and geological surveys, an evacuation plan in case the lake collapses, a sound engineering plan and an extensive system of training and evaluation. A five-year program through the National Centre for Hydrology and Meteorology (NHCM) on "Hydrology, cryosphere and water resources information and early warning services" will strengthen infrastructure for regular monitoring, risk assessment and risk-reduction interventions.

STRATEGIC OBJECTIVE 21: ENSURE SUSTAINABLE DEVELOPMENT OF HYDROPOWER

	Document focus	Competent authorities
Strategic Environmental Assessment Regulation, 2002	Guidelines for environmental impact assessment	National Environment Commission, Ministry of Health, Ministry of Economic Affairs, Ministry of Agriculture and Forests, Ministry of Works and Human Settlements, Dzongkhag, Thromde and Gewog Administrations
Bhutan Sustainable Hydropower Development Policy, 2008	Provides framework for sustainable expansion of the hydropower sector	
Water Regulation of Bhutan, 2014	Ensure minimum environmental flow to be maintained in rivers with hydropower projects	
Economic Development Policy, 2016	Aims at accelerating the sustainable growth of the large hydropower sector	
National Integrated Water Resource Management Plan 2016	Establishes framework and priorities for implementation of integrated water resources management	

Expand current hydropower capacity

Bhutan's *Economic Development Policy, 2016* is aimed at accelerating the sustainable growth of the large hydropower sector as a source of clean renewable energy. There are six fully commissioned hydropower projects with a total installed capacity of 2,326 MW in operation. This is less than 10% of the potential, and as per the policy, Bhutan aims to achieve a minimum power generation of 5,000 MW by 2022. Three new plants are at various stages of construction. Future hydropower plans incorporating storage reservoirs (at Bunakha, Sankosh, and Amochhu) may help stabilize and optimize electricity production.

Protect and manage upstream watersheds

There is an acknowledgement in the *Water Act of Bhutan, 2011* of the need to protect and manage the watersheds upstream of all hydropower plants. Watershed-based adaptation approaches are included in the *National Integrated Water Resource Management Plan, 2016* and in the Integrated River Basin Management Plans being rolled out. Action needs to be taken to give effect to provisions in the *Forest and Nature Conservation Rules and Regulations, 2017* for a plough-back mechanism of 1% of royalties from hydropower development, to offset the impacts and undertake watershed management activities.

Promote alternative renewable energy

The *Alternative Renewable Energy Policy, 2013* aims to promote alternate energy sources to diversify the energy base and enhance energy security, also using solar, wind biogas and small-scale hydropower, and developing off-grid electricity systems to reach remote mountain communities. By 2014 a start had been made, with 10 low-impact micro-hydropower and 13

mini-hydropower operations, contributing 8.8 MW of electricity. Action is being taken to feed in the experience being gained from development of non-hydro renewable energy sources into the *Power System Master Plan – 2040*, currently under development.

Carry out cumulative impact assessments

Strategic Environmental Assessments are provided for in terms of the *Economic Development Policy, 2016* for all new or revised Hydropower Public Private Partnerships, and a cumulative Impact Assessment was undertaken for multiple operations in the Kuri-Gongri basin in 2017. In terms of the *Environmental Assessment Act, 2000*, and the *Strategic Environmental Assessment Regulation, 2002*, detailed monitoring should be undertaken of social and environmental impacts and mitigation measures, with reporting on the success of actions taken for rehabilitation and restoration.

Ensure environmental flows in rivers

There is increasing awareness on the importance of ensuring environmental flows in the rivers, even after construction of hydropower projects. The minimum environmental flows for watercourses, set by the National Environmental Commission, were increased in the *Water Regulation of Bhutan, 2014* from 10% to at least 30% of the lean season flow, and are set out in the *Final Draft E-Flow Guidelines, 2019*, with training provided to hydropower developers. This will determine the necessary quantity, timing, and quality of water flow required to sustain freshwater and estuarine ecosystems, human livelihoods and well-being dependent on these ecosystems. A five-year program on "Strengthening water security and enhancing management", implemented by the NEC Secretariat, will take acrtion to enhance monitoring of environmental flow of major rivers.

STRATEGIC OBJECTIVE 22: ENSURE EFFICIENT USE OF WATER RESOURCES

	Document focus	Competent authorities
Water Act of Bhutan, 2011	Aims to ensure that the water resources are protected, conserved and/or managed in an economically efficient, socially equitable and environmentally sustainable manner	National Environment Commission, Ministry of Health, Ministry of Economic Affairs, Ministry of Agriculture and Forests, Ministry of Works and Human Settlements, Dzongkhag, Thromde and Gewog Administrations
National Integrated Water Resource Management Plan (NIWRMP), 2016	Establishes framework and priorities for implementation of integrated water resources management	

Manage water demand

The *Water Act of Bhutan, 2011*, aims to ensure that the water resources are protected, conserved and/or managed in an economically efficient, socially equitable and environmentally sustainable manner; the mandate of the National Environment Commission includes the promotion of water-friendly and water-efficient technologies. Managing demand for water is also one of the components of an IWRM approach, as set out in the *National Integrated Water Resource Management Plan, 2016*. This includes planned actions to adopt cost recovery policies, utilize water-efficient technologies, and establish decentralized water management authorities at all levels.

Adopt water-saving technologies

The *National Integrated Water Resource Management Plan, 2016* also highlights technologies related to higher water use efficiency in agriculture: use of mulch or plastic sheets to reduce evaporation; better irrigation scheduling to prevent over-irrigation; better puddling of paddy fields to reduce seepage losses; piped / lined supply channels to reduce conveyance losses; replacing surface (basin or furrow) irrigation with sprinklers or drip systems; and mixing plant residues in soil to improve water-holding capacity. Gewogs can also increase the number and volume of water retention structures such as check dams and rainwater tanks, and utilize groundwater through sinking bore-wells, where studies show this can be done sustainably without lowering the water table. In terms of the Plan, the Ministry of Agriculture and Forests has responsibility to design irrigation water conveyance infrastructure to optimize water use efficiency, and will take action to disseminate information through Dzongkhag Engineer and Agriculture Sectors (Note: There are no positions/ offices at Dzongkhag Irrigation and currently irrigation activities are overlooked by engineers and the agriculture sector).

Raise community awareness

Water User Associations, are mandated by the *Water Regulation of Bhutan, 2014*, to take necessary measures to ensure efficient use of water by members, and to mediate in any conflicts over water access and use. River Basin Management

Committees are charged with promoting and rewarding positive behavioural changes toward efficient water use and protection/maintenance of water sources. In terms of the Plan, the Ministry of Health is mandated to identify and provide incentives or subsidies for water saving schemes or better wastewater management in rural areas. Civil society also plays an important role in demand management and raising awareness on water-saving technologies. Actions are being taken by Thromde administrations to improve metering, water pricing and infrastructure maintenance. Surveys have shown that households in Thimphu are willing to pay significantly more than the current low monthly charge for water and sanitation, and the revenue generated can be used for improving and maintaining water supply and sewage networks[19].

Efficiency in water resource use

Globally, many economies are heavily dependent on natural resource use and extraction, and use water resources wastefully. Achieving sustainable consumption and production patterns has become vital. In Bhutan's farming areas, modern technologies and methods can be used to minimize water lost through seepage, e.g. lining irrigation channels. The scarcity of safe drinking water in and around populated areas has caused the government to invest considerable sums of in water storage and distribution systems, not all of which are efficient, and sometimes large amounts of water go to waste through poor management and maintenance. A draft policy on Sustainable Production and Consumption will include addressing the issue of water-efficiency, based on the vision in the *Bhutan Water Act, 2011* that water resources should be managed in an economically efficient, socially equitable, and environmentally sustainable manner. Changes in water-use efficiency over time can also be achieved through governance and financial mechanisms, taking action on water budgeting, governance structure and practices, non-revenue water rates and water tariffs.

Implementation Plan

Strategic Objective	Lead Agency	Collaborators	Key Performance Indicators
SO17: Institutionalize & implement IWRM	NEC	NEC, NCHM, LGs, MoAF All Ministries, Autonomous agencies, LGs, Thromdes	Strengthen IWRM: • Management plan, process and implementation • Water user associations • Stakeholder consultation and participation Improvement in service delivery: • Stakeholder consultations • Coordination meetings Integration of programs, plans and policies of other sectors dealing with water
SO18: Prevent Freshwater Pollution			
SO19: Improve access to safe drinking water & sanitation	MoH	NEC, MoWHS, LGs	• Proportion of population using safely managed drinking water services • Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water • Proportion of wastewater safely treated: 1. Number of wastewater treatment plants 2. Households connected to sewerage system
SO20: Prevent damage from flood disasters	DDM	MoWHS, NCHM, LGs, MoAF	• Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population • Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters Other key indicators: 1. Vulnerability assessment 2. Early warning system in place 3. Awareness 4. Disaster risk reduction plan 5. Agro meteorology services provided

SO21: Ensure sustainable development of Hydropower	MoEA	NCHM, LGs. DoFPS	• Number of detailed feasibility study and implementation in line with Hydropower Development Masterplan Other key indicators: 1. Strategic Environment Assessment carried out for the hydropower sector 2. Detailed consultation and integration of other sector's plans and policies in the river basin 3. Upstream down stream linkages 4. Hydrogeology assessments and the impact of hydropower development on the landscape, focus on water and wetlands.
SO22: Ensure efficient use of water resources	MoWHS	Thromdes, LGs	Change in water-use efficiency over time 1. Water budgeting 2. Governance structure and practices 3. Water saving mechanisms in place 4. NRW rates 5. Water tariff

Endnotes

[1] Asian Development Bank (2016) *Water: Securing Bhutan's Future*

[2] WWF (2016). *Water in Bhutan's Economy: Importance to Partners*

[3] Ministry of Agriculture and Forests Royal Government of Bhutan (2014). *National Biodiversity Strategies and Action Plan (NBSAP)*

[4] According to Thimphu City Cooperation, quoted in *12th Five Year Plan, 2018-2023*

[5] Royal Centre for Disease Control, Ministry of Health (2016)

[6] The *Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC)*

[7] Ministry of Agriculture and Forests (2016). *National Irrigation Master Plan*

[8] According to the *12th Five Year Plan, 2018-2023*, 92% of households in Bhutan now have access to improved sanitation facilities.

[9] Royal Government of Bhutan, *2017 Census*, quoted in *12th Five Year Plan, 2018-2023*

[10] A Ministry of Health assessment showed that 69 communities with 946 households have no water source, while and a further 48 communities with 888 households have an inadequate water source.

[11] The *Fifth Assessment Report of the Intergovernmental Panel on Climate Change* estimates that by 2100, South Asian countries, including Bhutan, will experience an 11% overall increase in rainfall during the wet season.

[12] 30-40 metres per year for those covered with debris and 8-10 metres per year for glaciers free of debris - ICIMOD 2017. Studies show that between 1980 and 2010, glacial lakes in Bhutan increased by 8.7%, while the glaciers shrank by 22%.

[13] Surveys have concluded that up to 25 of Bhutan's glacial lakes are at risk of a serious flooding event like this occurring, posing grave risk to communities living in the downstream valleys.

[14] According to the *Bhutan Energy Efficiency Baseline Study* (2012)

[15] If hydropower construction is included. The *12th Five Year Plan, 2018-2023* also notes that close to 85% of Bhutan's trade is with India, consisting mainly of hydropower.

[16] Irregularities reported in Royal Audit Authority, 2018 Annual Audit Report

[17] For example, see Namey-Nichu PES Agreement - https://snv.org/update/third-pes-agreement-bhutan

[18] Royal Centre for Disease Control, Ministry of Health (2018), *Drinking Water Quality Report*

[19] According to Thimphu City Cooperation, quoted in *12th Five Year Plan, 2018-2023*.


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Chapter 5:
LIFE

In Bhutan's rich tradition of Mahayana Buddhism, nature is seen as a living system of which people form a part. As Article 5 of the Constitution makes clear, every Bhutanese person is considered a trustee of the Kingdom's natural resources and environment. Bhutan is a global leader in conservation practices, with over 51% of its land under protected areas and biological corridors[1], and 71% of its land under forest cover. This was made possible by the farsighted vision and leadership of Bhutan's monarchs, and the Constitutional commitment to keep 60% of land under forest cover in perpetuity. Bhutan's progressive policies towards forest conservation and management are reflected in a strong national enabling environment, and a number of international commitments and multilateral environmental agreements (see Chapter 1).

Geographically, Bhutan forms the part of the Eastern Himalayan Biodiversity Hotspot with 23 important bird areas, 8 ecoregions, important plant areas, and wetland areas with 3 Ramsar sites. Forest is the dominant ecosystem in Bhutan, including subtropical, warm broad-leaved, cool broad-leaved, evergreen oak, spruce, hemlock, blue pine, chir pine and fir forest types and juniper-rhododendron and dry alpine scrub. The aquatic ecosystems of Bhutan consist mainly of major and minor rivers, lakes, marshlands and hot springs. Bhutan records more than 5,500 native species of vascular plants, 145 of which are found only in Bhutan, including 469 species of wild orchid, 46 different species of rhododendrons, and over 300 species of medicinal plants. More than 200 species of mammals are identified, of which 27 are globally threatened, including the snow leopard and red panda. Furthermore, Bhutan has recorded 740 species of birds, of which 18 are globally threatened, including the black-necked crane[2]. A wide range of ecosystem goods and services are also derived from natural resources – such as carbon sequestration, water provision, climate regulation, nature-based livelihoods etc.

Bhutan has always recognized and upheld the significance and role of environmental conservation in human well-being, guided by the enlightened leadership of our beloved Monarchs and the state religion of Buddhism that teaches respect for all life forms and their interdependence. This has ensured the emergence of Bhutan in the 21st century with its biodiversity largely intact in comparison to the global trends of loss of diversity of genes, species and ecosystems[3]. At the same time, growing population and development pressures are placing some strain on the balance between people and nature. [4] This section explores these challenges, to which the National Environment Strategy responds.

Challenges relating to human-wildlife conflict

Bhutan has inherited diverse and rich ecosystems and wildlife, but conservation efforts have not come without a price. Every year, our farmers are losing significant amounts of crops and livestock to wildlife depredation, as the interface between humans and wild animals increases. Bhutan cannot resort to any dramatic population reduction of the major wild predators, as many of them are globally threatened species[5]. Predators like tiger and leopard also occur at the top of the food chains in many ecosystems and help control populations of herbivores that consume crops.

Human-wildlife conflict (HWC) causes social disharmony and is a major constraint to agricultural sustainability and food security[6]. For instance, 24.6% of farmers surveyed in 2010 mentioned this conflict as a constraint in technology adoption, agricultural productivity and road infrastructure[7]. The loss of crops, livestock, and even


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human lives imposes social and economic costs that jeopardize livelihoods, exacerbate poverty, and can lead to retaliation against conservation programs. By 2008, annual crop loss ranged from 0.3 to 18% of total household income[8]. On average farmers spend about two months per year guarding their livestock and crops from wildlife. Guarding, which is mostly done at night, causes additional expenses, hardship, stress and loss of sleep. Strategies have been put in place to balance the needs of rural farming communities with those of the wildlife with whom they live in close proximity, but these strategies need more resources for implementation.


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In addition, further research is needed to understand the causes of particular human-wildlife conflicts. Some contact may simply be the result of a growing human population and a well-maintained protected area estate. However, indications are that in some areas, clearing of forest for infrastructure causes the loss of wildlife habitats and disrupts animal behaviour, forcing wild animals into human settlements in search of food that is easily accessible. Increased degradation of forested areas can lead to a loss in wildlife habitat and increase the encroachment of wild animals into village farms and cattle sheds[9]. Although development activities can improve living conditions in rural communities, they may also be exacerbating existing human-wildlife conflicts[10].

Challenges of forest loss and degradation

Forest clearing also opens up areas for exploitation which were inaccessible before, resulting in habitat fragmentation and loss of biodiversity[11]. Almost all the forest area in Bhutan is held under public administration, with over half of the forest area designated as protected areas and the remainder of the area as "state reserve forest" which includes several management regimes such as "forest management units", "community forests" and "local forests"[12]. With the rapid pace of socio-economic development, there is pressure on State Reserve Forest land to be converted for infrastructure development in the form of "right of cleared way" for power transmission lines and road construction.

Forest degradation is also a serious concern – as the forest is thinned through, livestock grazing beyond the Tsamdro, and illegal logging or over-extraction of timber and firewood, habitats are destroyed, exposed slopes become vulnerable to landslides and erosion, and the degraded forest becomes more vulnerable to fire. Bhutan's per capita fuel wood consumption is one of the highest in the world, since it remains the dominant source of energy for cooking and heating in rural areas[13]. The demand for timber for construction is also growing to supply construction activities for urban centres, industrial areas, hydropower plants, and public infrastructure. Much of these needs are illegally supplied from forests outside of the designated Forest Management Units (FMUs). Many FMUs lack well formulated resource management plans, and some do not fulfil their harvesting potential[14].

Besides timber and fuel wood, a wide array of non-wood forest products are extracted from the forest to generate additional income through sale and processing in cottage industries[15]. In many places, because of over exploitation, some species of medicinal plants, ferns, bamboo, and cane, which used to be collected in abundance, are also becoming increasingly rare, as is the lucrative Cordyceps fungus.

Challenges related to biodiversity loss

As per the 2019 United Nations report on the global biodiversity crisis[16], species extinctions are occurring at a faster rate than ever before in human history. Natural habitat is under pressure as a result of rapid urbanization, expansion of industry, crop and grazing lands. Main threats to Bhutan's biodiversity include land conversion, habitat fragmentation, unsustainable harvesting, illegal logging, river pollution by effluent and sewage, climate change and human-wildlife conflict. The poaching of Bengal tigers, bears, leopards, musk dear, wild boar, porcupine, python, and pheasants presents serious challenges to the species' well-being and survival, and retaliatory killings against damage-causing animals may continue if human-wildlife conflict is not brought under control.

Increasingly frequent forest fires also pose a threat to Bhutan's terrestrial fauna and flora. Forest fires are more frequent during the long dry spells of winter and may be exacerbated by changing climate patterns with increased strong winds. It is estimated that over 10,000 acres of forest cover is lost to fire on average every year, with some forest fires raging out of control for days, or even weeks. Catastrophic forest fires leave behind ecological devastation, threaten wildlife habitats, damage roads, and destroy hydropower infrastructure, undermining national conservation and developmental efforts. Bhutan's mountainous terrain makes fire-fighting difficult, and there is often little access to water.

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Aquatic biodiversity is also under threat, as freshwater habitats are disturbed by hydropower dams, dredging of sand from riverbeds, road construction, mining along rivers, and the introduction of alien fish species poses a threat to indigenous fish. The impact of hydropower on freshwater species and birds has been highlighted as a particular threat, for example, the site of the Punatsangchhu hydropower project was one of the habitats of the endangered White Bellied Heron, of which it is estimated there are only 200 birds remaining globally. Dams lead to obstruction of fish migration within feeding, spawning and refugee habitats[17], and flushing to clean sediments can devastate downstream flora and fauna. Even hydropower schemes without dams result in much lower water levels and increased sediment in rivers, posing a threat to fish, amphibians and freshwater invertebrates.

Climate change is expected to have significant effects on Bhutan's biodiversity. Although this area is not yet well researched, increases in temperature and changing rainfall patterns are expected to cause shifts in species ranges – as animals move to new habitats, and plants shift to higher elevations to escape warming trends. Increased temperatures and changing rainfall patterns may also allow for new invasions by alien species that are well adapted to the new climatic conditions, including pests and micro-organisms that cause disease.

Challenges for protected areas

In keeping with the country's rich biological diversity, the Royal Government of Bhutan has established a comprehensive system of protected areas covering 19,751 km^2 or 42.7% percent of the country's total surface area[18]. This includes five national parks, four wildlife sanctuaries, and one strict nature reserve, with representational samples of all natural ecosystems found in the country. To facilitate movement of wildlife and contiguity of habitats, biological corridors cover-


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ing a total area of more than 3,300 km^2 have been mapped, linking the protected areas – with a total area of 51.44% covered by protected areas (PAs) and biological corridors together. In most PAs, boundaries have not been clearly demarcated and zoned. This can lead to *ad hoc* planning and development of infrastructure, and difficulties in curbing encroachment and land use conversion. The biological corridors also lack boundary demarcation as well as conservation management plans, posing difficulties in protecting them from encroachment by human activities. There is a need to assess whether these routes need to be resized, relocated or better aligned.

The other major challenge until recently has been the lack of a sustainable financing mechanism to operate protected areas at the highest standard with enhanced management effectiveness. With the Bhutan for Life initiative in place, ongoing efforts are essential to ensure long-term financial sustainability of the protected area network, as Bhutan moves towards Middle Income Country status from 2023, with anticipated loss of some sources of international donor funding.

Challenges of tourism impacts

Tourism is a major source of employment in Bhutan, and the country's biggest hard-currency earner, bringing in USD 85.4 million in revenue in 2018, second only to hydropower[19]. Bhutan's main tourism attractions are its traditional culture and way of life, its religious festivals, historic monuments and its pristine environment. Our tourism policy since the start of the industry in the 1970s has reflected these concerns, with a policy of 'high-value, low-volume' tourism in order to control the type and quantity of tourism, and its impact on the culture and environment. Since 1987 climbing of Bhutan's sacred mountains has also been banned, preventing the kind of ecological degradation and pollution seen on busy climbing routes in other Himalayan countries. The policy of imposing a Minimum Daily Package rate of US$ 200 to 250-per-person-per-night has succeeded in providing a source of government income for education, health and building tourism and transport infrastructure, while at the same time making tourism in Bhutan an exclusive and distinctive experience. But, growth of the sector has come with a number of challenges, as visitor numbers increase, and the high value component decreases, as a percentage of total tourism spend[20].

Bhutan received a total of 274,097 visitors in 2018, more than 200,000 of whom were regional tourists[21], who are not subject to the minimum daily spending requirements, can stay in budget accommodation, and are not required to employ guides. This helps to provide year-round occupancy in hotels, but causes overcrowding at popular sites in the more heavily visited region from Paro to Bumthang. In addition to social impacts, this can cause environmental degradation – as concentrations of visitors put pressure on fragile ecosystems and cause an increase in waste and litter. Bhutan is revising its tourism policy, but needs improved coordination between all sectors involved. As new tourism products are developed, it is vital to ensure that their environmental impact does not increase, for example, more vehicles contributing to air pollution, or opening up of sport fishing, posing a threat to endangered species.

Challenges related to illegal extraction of natural resources

In terms of legislation, no hunting, fishing or timber extraction is allowed from the vast area covered by the nation's five national parks, four wildlife sanctuaries, and one strict nature reserve. Forest offences recorded by the Department of Forests and Park Services in 2017

included illegal removal of timber and firewood; illegal extraction of sand, soil and boulders; illegal harvesting of cordyceps and other non-wood forest products; poaching of wildlife; and illegal fishing. Enforcement of the legislation has become a growing challenge in recent decades, as illegal logging has increased, with valuable hardwood timber such as *Sidha*, *Legerstremia perviflora*, *Tita chap Michelia champaka*, *Lali*, *Laidor*, *Prali*, *Oxi* and *Sal*, smuggled out in trucks and handcarts across the border with India[22]. Well-armed illegal logging syndicates from across the border have allegedly been masterminded by foreign nationals, but supported by local labour of villagers who lack alternative income opportunities.

A high-profile case in 2012 in which officials of the Forest Protection and Surveillance Unit tracked down and apprehended three long-time poachers in connection with the illegal trafficking of tiger and leopard parts, put the spotlight on the country's vulnerability. The discovery of confiscated pelt, bones, and tiger parts revealed that a total of 17 adult tigers had been lost from Bhutan and bordering areas of India over the period 2012-2017, mostly to poaching[23]. The Global Tiger Centre has identified poaching hotspots in and around the Jigme Singye Wangchuck and Royal Manas National Parks, and along the porous border with India. Poaching of other animals, such as bears, musk dear, wild boar, porcupine, python and pheasants also occur regularly, posing threats to some species' survival.

Challenges related to invasive alien species

Worldwide, exotic plants and animals introduced to countries from outside – both deliberately through trade and accidentally through travel – are having a negative effect on native species and their ecosystems, often spreading out of control. In Bhutan, invasive plant species are affecting crop yields in some areas and using up scarce water resources in others. Of the 300 exotic plant species introduced to Bhutan, including ornamental plants, fodder species, crops, fruits and vegetables, some 36 species have been found to be invasive[24] including six of the world's worst known invasive species. These are commonly found in pastures, roadsides, distrubed areas, barren lands and human settlement areas, e.g. *Ageratina adenophora*, commonly known as crofton weed or sticky snakeroot[25], Lantana camara, Mikania micrantha and Chromolaena odorata. Critically, new insects and pathogens are introduced via exotic plants, becoming pests in agriculture.

Biological invasions are also occurring in Bhutan's lakes and rivers, as species of carp and other fish, first introduced for their food value, are now out-competing native fish and are considered to be the second leading cause of species extinction, after habitat destruction. Examples are brown trout, Mozambique tilapia, and African sharptooth catfish – which has already colonized major rivers and water bodies in India, destroying native fish stock; and has invaded wetlands, where it preys on small terrestrial birds, aquatic birds and turtles. Although research is increasing, at present there is no comprehensive inventory and assessment of invasive alien species (IAS) and their impacts in Bhutan, and coordinated system for management and control.

Challenges in preserving agro-biodiversity and genetic resources

Bhutan is rich in agro-biodiversity, having more than 100 species of crops that are indigenous to the country[26]. At present, the documentation and conservation of the local diversity of cultivated plants and domesticated animals are still ongoing, focusing on ex-situ and on farm conservation. Nevertheless, the lack of adequate human, technical and financial capacities still pose a huge challenge. Current trends of rural-urban migration, depletion in farm labour, human-wildlife conflict, access to new crop varieties and livestock breeds, and monetization of farm economy are additional factors that contribute to the loss of agro-biodiversity if timely steps to conserve them are not taken.

Since the Convention on Biological Diversity entered into force in 1993, users of genetic resourc-

es have in theory been obliged to get permission before collecting biological resources and using traditional knowledge, to agree on the terms for exchange, and to share benefits fairly with local providers and countries[27]. To give effect to this, Bhutan ratified the Nagoya Protocol in 2013 and while the policy and regulatory framework for the implementation of the Access and Benefit Sharing (ABS) regime has been established, challenges still remain in terms of lack of adequate human and technical resources to keep abreast of developments in the world of science and technology related to genetic resources.

- *Strategic Objective 23*: Sustainably manage human-wildlife conflict
- *Strategic Objective 24*: Support sustainable forest management
- *Strategic Objective 25*: Conserve Bhutan's biodiversity
- *Strategic Objective 26*: Sustain the protected areas network
- *Strategic Objective 27:* Promote sustainable tourism
- *Strategic Objective 28*: Prevent and combat poaching, illegal harvest and trade
- *Strategic Objective 29*: Prevent spread of alien invasive species
- *Strategic Objective 30:* Preserve diversity of crops and livestock
- *Strategic Objective 31:* Share benefits of genetic diversity

STRATEGIC OBJECTIVE 23: SUSTAINABLY MANAGE HUMAN-WILDLIFE CONFLICT

	Relevant guidance	Competent authorities
Bhutan National Human-Wildlife Conflicts Strategy, 2008	Outlines strategies to reduce human-wildlife conflict to a manageable level, enhance farmers' livelihoods, and offset losses from wildlife damages	Ministry of Agriculture and Forests – Department of Agriculture, Department of Livestock, Nature Conservation Division, Department of Forest and Park Services, Department of Policy and Planning Division
Human-Wildlife Conflict SAFE Strategy: Nine Gewogs of Bhutan, 2016	Proposes multi-faceted actions to make an area safe for people, assets, wildlife and habitat	

Implement strategy to manage conflict

Bhutan's *National Human Wildlife Conflicts Strategy, 2008* addresses human-wildlife conflict through a comprehensive consideration of social, economic and ecological factors to achieve lasting solutions. Cross-cutting action plans are outlined to (i) protect crops and livestock, (ii) compensate losses, (iii) develop crop/livestock insurance schemes, (iv) offer suggestions for alternative livelihoods to offset losses, and (v) to educate and create awareness programs for wildlife conservation and human-wildlife conflicts. Under the Bhutan for Life Program there is a specific milestone dedicated to reducing HWC as a result of adoption of appropriate policies, technologies and systems, targeting to benefit 80% of households living in and near protected areas from reduced HWC by 2022. Actions include updating the strategy every five years, and proposing amendments for relevant policies, including innovative responses such as alternative crops, rainwater harvesting, habitat enrichment and biological barriers.

Improve understanding through research

The Bhutan for Life milestone dedicated to reducing human-wildlife conflict includes a commitment to understanding its causes in more depth, and assessing and mapping HWC hotspots nationwide. This builds on the work done for the *National Human Wildlife Conflicts Strategy, 2008* which investigated the need for specific and differentiated strategies for conflict between rural communities and carnivores, wild pigs, ungulates, elephants and primates. Examples include, initiating regulated hunting by tourists to control wild pig populations where appropriate, cultivating molasses grass around crops to repel primates, or improving compensation for livestock predation by tigers, leopards, and snow leopards. Key actions include continued monitoring of HWC incidents and their impacts, and mapping by the Department of Forest and Park Services of hotspot areas for each species, which will help in targeting of management measures.

Create safe environment for communities

The *Human-Wildlife Conflict SAFE Strategy: Nine Gewogs of Bhutan, 2016* took community protection measures forward in nine Gewogs that are particularly vulnerable to poverty and losses from wildlife. The approach intends to create a safe environment both for people and their assets, and for wildlife and their habitats – in a landscape for their harmonious co-existence, as well as improved monitoring. This includes actions for: "Safe Person" e.g. response teams, compensation schemes, alternative livelihoods and income diversification; "Safe Assets" e.g. fencing to reduce crop loss, watch towers and search lights for guarding. There is a need to expand fencing initiatives nationwide, with Dzongkhags encouraging Gewogs to employ best practices – such as plastic recycled poles instead of wood, and solar power for electric fencing, including alarm systems and emission of sounds that mimic predator dynamics to keep them at bay.

Manage wildlife habitat

In terms of the *Human-Wildlife Conflict SAFE Strategy* there is also a need for interventions for "Safe Habitat" e.g. community forest patrols, habitat enrichment with fodder, fruit trees, water holes and salt licks; and "Safe Wildlife" e.g. research on hotspot areas and species, prevent of illegal killing and poaching, and developing positive linkages through ecotourism. Managing wildlife habitat effectively, and supplementing their food sources, can be helpful in keeping damage-causing animals away from settlements. Also important are maintaining boundary demarcation of protected areas, and discouraging people from entering forests for purposes of illegal activities. These actions form part of the strengthening of the wildlife management system by the Department of Forest and Park Services.

Strengthen community-based crop and livestock compensation

A human-wildlife endowment fund, led by the Ministry of Agriculture and Forests, has been established as a compensation scheme for loss of crops and livestock to damage-causing animals. The fund acknowledges the livelihood and food insecurity impacts of crop and livestock loss, sometimes causing hunger or nutritional deficiencies, loss of cash income, increased debt and aggravation of pre-existing poverty. The central endowment fund replaces the concept of an insurance scheme, as implemented previously through disbursements to Gewogs Environment Conservation Committees. The intention is for the fund to be a sustainable financing mechanism – targeting the investment of USD 35 million of capital, so that compensation payments can be made from the interest in perpetuity. The human-wildlife endowment fund will be extended as a milestone of the Bhutan for Life initiative and is one of its thematic funding areas, to ensure that the compensation schemes are sustainable and can meet all farmers' needs.

STRATEGIC OBJECTIVE 24: SUPPORT SUSTAINABLE FOREST MANAGEMENT

	Relevant guidance	Competent authorities
National Forest Policy, 2011	Sets framework for forest conservation and scientific management, including forest utilization	Ministry of Agriculture and Forests: Division of Policy and Planning, Department of Forests and Park Services, Watershed Management Division; Ugyen Wangchuck Institute for Conservation and Environment; Dzongkhag, Thromde and Gewog Administrations
Forest and Nature Conservation Act, 1995	Provides for protection and sustainable use of forests, wildlife and natural resources	
Rules on Biological Corridors, 2006	Provide for the conservation and management of biological corridors linking protected areas for safe movement of wildlife	
Forest Fire Rule, 2012	Sets out responsibilities for maintaining fire lines, permits for burning agricultural debris, and safety measures for economic activities	
Forest and Nature Conservation Rules and Regulations, 2006 and update 2017	Provides detailed rules to guide implementation of the Forest and Nature Conservation Act	
Framework for management and marketing of NWFPs 2011	Prescribes the basic sustainable harvesting and management of 60 potiential NWFPs	

Maintain forest for climate adaptation and mitigation

Bhutan's first *Nationally Determined Contribution 2015* towards the Paris Agreement reconfirms Government's commitment to sustainable forest management, integrated forest fire management, rehabilitation of degraded and barren forest lands, conducting periodic inventories of forest cover and condition, and reducing timber use by promoting viable alternatives to timber and fuel wood at a large scale. Strict implementation and monitoring of *Forest and Nature Conservation Act, 1995* also involves preventing illegal encroachment of forests for unplanned settlements or agriculture, including Tseri (shifting cultivation) practices. Since 2013, Bhutan is also committed to REDD+ (Reducing Emissions from Deforestation and Forest Degradation[28]). This involves developing Bhutan's National REDD+ Strategy and Implementation Framework, including the

National Forest Monitoring System, its Measurement, Reporting and Verification function, the Forest Reference Emission Level and the Safeguard Information System. Bhutan has developed a National Forest Monitoring Action Plan and completed its first full National Forest Inventory, to be repeated every five years.

Promote climate-smart forest management

The *National Forest Policy, 2011* defines the overarching goal of sustainable management of forest resources and biodiversity. The *Forest and Nature Conservation Rules and Regulations, 2017* cover general aspects of managing State Reserved Forest Land (SRFL) and prescriptions for Forest Management Units, Community Forests, Protected Areas and watersheds. Actions needed are to: (i) integrate climate change into forest management planning to foster adaptation to changing climatic conditions; (ii) adopt proactive, forward-looking forest management approaches, e.g. anticipating increased fires through prescribed burns; (iii) adopt active climate-smart management options such as setting aside conservation refugia, assisting regeneration, and promoting mixed species planting for enhanced resilience; and (iv) include long term planning tools such as species distribution models, scenario-based approaches to recognize uncertainty and dynamic change in the climate and their impacts on forest ecosystems.

Reduce forest fire


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Bhutan's holistic and integrated forest fire management strategy, supported by the *Forest Fire Rule, 2012*, includes controlled fire use where appropriate. The Rule sets out the roles of different levels of government, and required measures for preventing unplanned fires –maintaining fire lines around infrastructure, issuing permits for burning agricultural debris, and maintaining safety measures for economic activities. Key actions include capacity development for forestry officials on investigating how fires started, so that penalties can be imposed on culprits. In addition to enforcement, Bhutan's strategy emphasizes ongoing advocacy and awareness to inform citizens on how to avoid accidentally starting forest fires (young children, picnickers, smokers and electrical short circuit are among the top causes), and demonstrates how to burn agricultural residues and other waste safely. Actions also include strengthening capacity of forest fire management committees at Dzongkhag and Gewog levels, supplying firefighting and protection equipment and technical training at the field level. Training, education, awareness, resource and organizational needs repeatedly emerge as priority issues and will be key to successful management of forest fires in Bhutan.

Strengthen social forestry

The movement towards community forests started with the enactment of the *Forest and Nature Conservation Act, 1995*, which encouraged public participation in forest management by handing over portions of forest land to communities, based on approved management plans, and also encouraged private forestry. Bhutan's people-centred approach to forest management was set out in detail in the *National Strategy for Community Forests: The Way Ahead, 2009–2019*. Today Bhutan has 781 Community Forests, covering an area of 92,165 hectares, and benefiting 32,402 households[29], and there is a need to strengthen and extend the system further. Actions by Dzongkhag Forestry Offices to capacitate community forest structures can help enable effective management measures for sustainability and climate change, ensure eq-

uitable distribution of resources, promote new income-generating activities, and facilitate new partnerships for Payments for Ecosystems Services (PES) agreements where possible.

Promote Payments for Ecosystem Services

Payment for Environment Services (PES) initiative started in Bhutan with a feasibility study in 2009. In 2010, the Watershed Management Division (WMD) was able to establish the first PES site in the country at Mongar between Yakpagang Community Forest Management Group (CFMG) and Mongar municipality. The first contractual period was signed for three years, and expired in December 2014, it was further reviewed and revised for another five-year term till 2019, with a revised fee structure in 2015. Another PES scheme on water source conservation was established 2015 at Pasakha under Chhukha Dzongkhag between Burkhey watershed community and the five industrial companies based in Pasakha. The third PES site on water source conservation was established at Namay Nichu under Paro Dzongkhag between CFMG members and the water users (four hoteliers and a water user association). WMD has developed and distributed the PES framework and field guide to all the relevant stakeholders including Dzongkhag administrations for action to upscale PES programs in the country[30].

Encourage sustainable harvesting

Besides timber and fuel wood, a wide array of non-wood forest products (NWFP) are extracted from the forest to generate additional income through sale and processing in cottage industries. These include medicinal and aromatic plants, edible mushrooms, ferns, wild greens; bamboo and cane for local handicrafts; bark and pulp for traditional paper-making; honey and beeswax, resins, sticklac and cordyceps, animal fodder; and leaf litter for farmyard manure production collected from Sokshing (owned by the state but used by the people). Over-exploitation of some forest products has made them increasingly scarce. Currently only 5,564 households are involved in 148 Non-Wood Forest Product groups[31], there is a need to strengthen and grow such groups with the support of the Dzongkhag Forestry Offices. Actions needed include prevention of illegal exploitation, e.g. of Cordyceps, enhance implementation of guidelines for sustainable management and promote value addition of NWFPs. The capacity of NWFP groups can be strengthened to develop sustainable harvesting management plans, specifying locations for rotational harvesting, and time periods for intermittent harvesting, promote awareness and conduct monitoring. A five-year program being carried out by the Ministry of Agriculture and Forestry on “Sustainable natural resources management and utilisation” aims to support this process.

STRATEGIC OBJECTIVE 25: CONSERVE BHUTAN'S BIODIVERSITY

	Relevant guidance	Competent authorities
National Environment Protection Act, 2007	Sets framework for environmental protection and management including protection of forests, biodiversity, and ecosystem integrity	Ministry of Agriculture and Forests; National Environment Commission; Ugyen Wangchuck Institute for Conservation and Environment
National Biodiversity Strategy and Action Plan, 2014	Proposes a series of biodiversity conservation objectives and associated actions	
Penal Code Act of Bhutan, 2004, amended in 2011	Upgrades to a felony of the fourth degree the offence of "risking the protected species" –	Ministry of Home and Cultural Affairs, Attorney General of Bhutan
Biodivesity Act of Bhutan 2003 and Forest and Nature Conservation Act 1995	Prevent misappropriation of biological resources and ensure fair and equitable sharing of benefits arising from access to biological resources	NBC, Ministry of Agriculture and Forests

Implement biodiversity strategies and actions

As a signatory to the UN Convention on Biological Diversity since 1995, as well as the Ramsar Conventions on Wetlands and CITES, Bhutan has in place a *National Biodiversity Strategy and Action Plan, 2014*. The NBSAP sets out National Targets for: (i) public awareness of biodiversity values; (ii) integration into development planning; (iii) harmful incentives reform and introduction of positive incentives; (iv) sustainable production and consumption; (v) habitat mapping and trend monitoring; (vi) baseline on aquatic biodiversity; (vii) sustainable agriculture and forestry; (viii) reduction of pollution including agro-chemicals; (ix) invasive alien species management; (x) adaptation to climate impacts; (xi) strengthening protected area system; (xii) information on conservation status; (xiii) indigenous agro-biodiversity; (xiv) identification of ecosystem services; (xv) rehabilitation of degraded ecosystems; (xvi) access and benefit sharing; (xvii) NBSAP guidance; (xviii) documentation of traditional knowledge; (xix) science-based technologies; and (xx) fund mobilization. Bhutan's 6th National Report to the CBD[32] identifies significant progress in many of these areas, as well as outstanding challenges including the need for more comprehensive data collection, monitoring and research.

Protect terrestrial ecosystems

The most significant outcome achieved as a result of NBSAP implementation is the maintenance and management of a macro-level natural landscape of protected areas (42.7% of country) consolidated through biological corridors (8.6%).

This estate encompasses a continuum of representational samples of all major ecosystems found in the country, ranging from the tropical/subtropical grasslands and forests in the southern foothills, to temperate forests in the central mountains and valleys, to alpine meadows and scree in the northern mountains. Effective management and sustainable financing of the protected areas network is the goal of the Bhutan for Life initiative, which also has milestones dedicated towards species conservation. In managing the protected areas network, it will be important to better understand the likely impacts of climate change on biodiversity, including the potential habitat shifts of particular flora and fauna, e.g. vegetation moving to higher elevation. Actions to protect and maintain intact habitats that include climate refugia will be a challenge for the decades ahead.

Maintain freshwater habitats

In addition to the terrestrial network, it will also be vital to protect aquatic and riverine eco-systems through implementation of environmental impact assessments, and restricting diversion of water courses. Studies are underway to identify a free-flowing river to be declared and protected for all times, to ensure conservation of aquatic biodiversity, raise awareness and serve as a baseline for research. This will be supported by a five-year program from 2018-2023 on "Strengthening water security and enhancing management" being implemented by the National Environment Commission, to enhance monitoring of the environmental flow of major rivers. Other conservation actions are being prioritized by the Ministry of Agriculture and Forests to bring new wetland areas under protection, since these are important habitats for birds, fish and amphibians, and also vital for protecting the delivery of ecosystem services to communities in a changing climate.

Conserve threatened species

Parallel to the country's major investment in protected areas, Bhutan has engaged in several conservation programs targeting particular vulnerable species and their habitats. Many such programs are being carried out with support from civil society – for example, a program to conserve the endangered Golden mahseer fish species, considered sacred in Bhutanese culture. A Tiger Action Plan was launched in 2017, to enhance conservation, mitigate conflict, and reduce poaching, as well as, an Elephant Conservation Action Plan in 2018, working to maintain a viable population of elephants in an improved habitat, with reduced human-elephant conflict. Bhutan is yet to carry out a national-level evaluation of the conservation status of all its biodiversity, but surveys have been carried out nationwide of key species – tiger, snow leopard, takin, red panda, golden langur, elephant and small cats. Monitoring of the national tiger population is seen as a key indicator of ecosystem health, and is measured in the five-year planning cycle.


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STRATEGIC OBJECTIVE 26: SUSTAIN THE PROTECTED AREAS NETWORK

	Relevant guidance	Competent authorities
Forest and Nature Conservation Act, 1995	Provides for protection and sustainable use of forests, wildlife and natural resources	Ministry of Agriculture and Forests; National Environment Commission; Dzongkhag and Thromde Administrations
National Biodiversity Strategy and Action Plan, 2014	Proposes a series of biodiversity conservation objectives and associated actions including on protected area management	

Implement Bhutan for Life

The Bhutan for Life (BFL) initiative was formally launched in 2017 as an innovative funding mechanism for long-term, sustainable financing of the country's Protected Areas network, established by the Royal Government of Bhutan in partnership with the WWF. The initiative raised USD 43 million in transition funding, through government, private and multilateral donors[33], to secure the maintenance of the protected areas estate in perpetuity, through a Project Finance for Permanence Model. Bhutan for Life has overall four goals, 16 milestones and over 80 activities to be achieved by the end of 14 years. The overall goal is to ensure a robust network of protected areas and biological corridors in Bhutan that contributes to human wellbeing and biodiversity conservation, and increases Bhutan's resilience to effects of climate change. The funds will be used to implement conservation actions in Bhutan's protected areas and biological corridors for the next 14 years, with national funding progressively taking over towards the end of this period.

Diversify conservation finance

In the context of Bhutan's graduation by 2023 from Least Developed Country to Middle Income Country status, certain funding sources will no longer be available to the country, and there will be a need for a diversified approach to sustaining conservation finance. Efforts are underway to help define and quantify Bhutan's current investment in biodiversity conservation and combating climate change; identify its financial needs and gaps through national assessments; and identify resource mobilization challenges and opportunities, including potential new revenue streams. This involves expanding the traditional boundaries of development finance to consider private sectors and other partners, in line with the blended finance vision of the 2030 Agenda for Sustainable Development[34]. The country's national conservation trust fund also continues

to build up its endowment (tripled from the initial investment of USD 21 million) and finances many conservation initiatives with communities.

Improve management effectiveness

Management plans of five of the ten protected areas were recently revised and NBSAP targets integrated into the revised plans. Based on new zonation guidelines, these protected areas (PAs) were also demarcated and zoned for effective management. A new tool, the Bhutan METT+ (Management Effectiveness Tracking Tool) was devised and used for all the ten of the protected areas and the Royal Botanical Park between 2016 and 2018, culminating in a Bhutan State of Park report. The Bhutan METT + is now being mainstreamed into the PA management plans and will be conducted every five years to track progress. The overall results show that protected areas in Bhutan are well managed; but their effectiveness is limited both by a low level of resources (both financial and appropriate technical resources) and by gaps in the monitoring and research data. Actions are needed to address these gaps in order to understand the impact of conservation measures, react to changing conditions and to adapt management to improve efficiency and effectiveness.

Conserve transboundary and cultural landscapes

In order to ensure that the mosaic of conservation space in the eastern Himalayas is maintained through transboundary conservation mechanisms, the Kanchanjunga Landscape Conservation Development Initiative (India, Bhutan and Nepal) and the Transboundary Manas Conservation Area (Bhutan and India) have been initiated, in collaboration with civil society partners. Bhutan is also working to protect its cultural landscapes, since the Constitution provides that the state shall endeavour to preserve, protect and promote the cultural heritage of the country including monuments, places and objects of artistic or historic interest, dzongs, lhakhangs, goendeys, ten-sum, nyes, and language among others. A cultural landscape is generally defined as “a geographic area, including both cultural, natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.” Actions are needed to resource these landscape-wide and transboundary initiatives, and to promote public awareness on their importance.

STRATEGIC OBJECTIVE 27: PROMOTE SUSTAINABLE TOURISM

	Relevant guidance	Competent authorities
National Environment Protection Act, 2007	Sets framework for environmental protection and management including protection of forests, biodiversity, and ecosystem integrity	Ministry of Economic Affairs; Ministry of Trade and Industry – Department of Tourism; Tourism Council of Bhutan, Ministry of Agriculture and Forests; National Environment Commission, Dzongkhag Administrations
Economic Development Policy, 2016	Sets out approach of 'high value, low impact' tourism, promoting tourism as an important growth sector – throughout the country, all year round, and as a means to diversify the rural economy	
Tourism Rules and Regulations, 2017	Guides licensing of tourism operators, visa applications and setting of daily fees	

Grow sector within carrying capacity

The *Final Draft Tourism Policy of the Kingdom of Bhutan, 2019* reaffirms the guiding principles underpinning Bhutan's vision for sustainable tourism – consistency with Gross National Happiness, and the "High value, Low volume" tourism approach. As visitor numbers have grown,[35] entry fees have been imposed at popular monuments and heritage sites, and consideration is being given to capping regional visitor numbers, with advance e-permits for visitors arriving by road and extension of sustainable development fees to all. In the new policy, the importance of promoting regional and seasonal spread is highlighted, with equitable growth and benefit sharing. A commitment is made to ensure that visitor numbers remain within the carrying capacity of our physical, socio-cultural and natural environment. The Tourism Council of Bhutan is charged with assessing the absorptive carrying capacity at national, dzongkhag and site level – of infrastructure, culture, environment and services. An important action is for more detailed area-specific studies to be carried out – like the *Carrying capacity study for Gantey-Phobjikha and Haa.*

Diversify and spread tourism offering

In terms of the *Final Draft Tourism Policy, 2019* there is an active focus on diversifying tourism products and offerings, encouraging the spread of tourists geographically beyond the hotspots in the west and north. The policy highlights the potential for; nature-based adventure activities; local cuisines, arts and crafts, traditional medicine; wellness, spiritual and conference tourism; as well as Bhutan as a unique filming location. A five-year program from *2018-2023* sets aside significant funds for a Sustainable Tourism Development Flagship Program, including adventure sports, highland festivals, rock-climbing, birdwatching, and heritage tours in the east and central regions. As part of the new plan, recreational fishing of golden and chocolate mahseer, banned since the 1970s, is expected to be introduced soon, on a catch-and-release basis and under strict guidelines.

Enhance livelihoods through ecotourism

The *Final Draft Tourism Policy, 2019* mandates the Tourism Council of Bhutan to enhance and promote ecotourism development, promoting nature-based travel through investment facilitation, enabling frameworks, capacities and benefit sharing mechanisms. The *Bhutan National Eco-Tourism Strategy, 2001* is being updated through the Bhutan for Life program, as are the existing *Guidelines for Planning and Management for Eco Tourism Development in the Protected Areas Network of Bhutan*, in a new document being developed by the Nature Conservation Division, Department of Forest and Park Services. Under Bhutan for Life, a specific milestone is dedicated to enhancing communities' livelihoods through ecotourism and programs to manage the sustainable harvesting and processing of non-wood forest products (NFWPs). By the end of the Bhutan For Life period, the target is that 80% of the households living in and around Protected Areas should have increased access to nature-based employment and income-generating opportunities through ecotourism and NWFP.

Promote sustainable consumption

International partnerships have enabled the development of green hotel guidelines, compliant with the Global Sustainable Tourism Council guidelines and adapted to the Bhutanese context. This encourages sustainable consumption and production, for example reducing water use or encouraging wastewater treatment. In 2018, the National Environment Commission invited hotels to apply to be part of the pilot phase for testing the guidelines. The tourism Flagship Program also includes a specific component on waste management, allied to tourism across the country. The Flagship Program will undertake focused end-to-end activities in five strategically placed Dzongkhags for accelerated tourism development, aiming to create 15,000 additional jobs, whilst controlling environmental impact. Implementation will be led by the Tourism Council of Bhutan in collaboration with local government, the Ministry of Economic Affairs and the private sector.

STRATEGIC OBJECTIVE 28: PREVENT AND COMBAT POACHING, ILLEGAL HARVEST AND TRADE

	Relevant guidance	Competent authorities
Penal Code of Bhutan, 2004, amended in 2011	Establishes risking of the protected species as an offence punishable by law, amended to be a fourth-degree felony	Attorney General of Bhutan; Ministry of Home and Cultural Affairs
Forest and Nature Conservation Rules and Regulations, 2006 and update 2017	Provides detailed rules to guide implementation of the Forest and Nature Conservation Act	Ministry of Agriculture and Forests; National Environment Commission; Dzongkhag and Thromde Administrations
National Biodiversity Strategy and Action Plan, 2014	Proposes a series of biodiversity conservation objectives and associated actions including against illegal logging and wildlife trafficking	

Prevent illegal hunting and fishing

The *Penal Code of Bhutan, 2004* establishes that it is unlawful to hunt, destroy, capture, collect, transact or deal in the sale of any animal or plant species or its parts, in a manner that poses a risk to the species' survival[36]. In terms of the *Forest and Nature Conservation Rules, 2006* (revised in 2017), no extraction of natural resources is allowed from inside protected area boundaries. There were 25 arrests of poachers in 2017[37], and 20 arrests in 2018[38], indicating a possible decrease, although many more incidents go undetected. A Draft National Zero Poaching Strategy was developed with civil society in 2017, bringing stakeholders together to strengthen enforcement and minimize poaching and illegal trafficking across borders through six pillars of action – assessment, technology, capacity, community, prosecution and cooperation. This includes imposing heavy fines on convicted offenders, promoting public awareness[39] and discouraging any kind of support to the illegal wildlife supply chain. It also includes action to complete the process of mapping poaching hotspots for targeted enforcement efforts.

Prevent illegal extraction from forests

Forest offences recorded by the Department of Forests and Park Services in 2018 included 924 arrests following illegal removal of timber[40].

Enforcement of the legislation has become a growing challenge in recent decades, not just preventing illegal extraction for household fuel and construction, but combating organized illegal logging of valuable hardwood timber species, that are smuggled across the border with India[41]. Although the country has only 1,392 foresters on the ground[42], the government is committed to strengthening enforcement capacity in the protected areas estate through the Bhutan for Life program. Enforcement includes active monitoring of protected areas for signs of illegal removal of timber and construction material like rocks and sand, illegal harvesting of non-wood forest products, wildlife poaching, and illegal fishing. Apprehended suspects are being prosecuted wherever possible, and penalties imposed when convictions are achieved, with public debate occurring about whether such fines should be increased. Areas where logging has occurred are also being targeted for reforestation activities carried out by Green Bhutan Corporation Limited.

Develop ranger capacity

Until recent years, rangers in Bhutan's protected areas were unable to stop illegal loggers and poachers, who were often better equipped and resourced than the rangers. Ranger numbers were insufficient as they lacked equipment and budgets for frequent patrols and patrolling at night. They were mostly not formally or systematically trained for their challenging and dangerous work. With the expansion of the Bhutan for Life initiative, ranger training and SMART (Spatial Monitoring and Reporting Tool) patrolling are key actions being rolled out across all Bhutan's protected areas. Rangers learn tactical skills such as apprehension and detaining of suspects correctly and legally, as well as, recognising and identifying signs and evidence of illegal or restricted activities in the field.

Enhance international cooperation

At international level, Bhutan has been a signatory to the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) since 2002. Poaching and illegal wildlife trade are the most serious and immediate threats to Asia's many charismatic and iconic species, such as tiger, rhino and elephants. Recent studies have shown that illegal wildlife trade is one of the top-five most lucrative illicit economies globally and is valued around $23 billion per year[43]. Bhutan is home to an estimated 103 adult breeding tigers, and forms the critical linkage for connectivity and gene flow between tiger populations in the Indian subcontinent with the Indo-Chinese tiger. A key action is the continued strengthening of international cooperation through regular Border District Coordination Meetings between Bhutan and India, with synchronized patrolling to promote the cross-border anti-poaching program and curb timber smuggling as well as wildlife trafficking. The *12th Five Year Plan, 2018-2023* sets as a target that the number of tigers remains stable or increases by the end of the plan period.

STRATEGIC OBJECTIVE 29: PREVENT SPREAD OF ALIEN INVASIVE SPECIES

	Relevant guidance	Competent authorities
Plant Quarantine Act of Bhutan, 1993	Enacted to prevent the introduction of existing pests, and restrict spread of new pests or eradicate them	National Biodiversity Centre; Bhutan Agriculture and Food Regulatory Authority; Ministry of Agriculture and Forests: Department of Policy and Planning, Department of Forest and Park Services; Dzongkhag Administrations
Seeds Act, 2000	Regulates the import and export of agriculture seeds to prevent introduction of undesirable plants and disease	
National Biodiversity Strategy and Action Plan, 2014	Proposes a series of biodiversity conservation actions including on invasive alien species	

Strengthen management system

Bhutan's *National Biodiversity Strategy and Action Plan, 2014* includes a target that invasive alien fauna and flora species that cause harm to Bhutan's indigenous ecosystems should be systematically identified. The pathways through which they are introduced should be identified and prioritized, priority species controlled or eradicated, and measures put in place to prevent their introduction and establishment. Invasive Alien Species (IAS) is a crosscutting issue with no lead agency, and most control measures are reactive – for example, when there is an outbreak of pests. Following a number of surveys, inventory lists are now being maintained by the National Biodiversity Centre, and regulations are being developed for prevention and control on spread of invasive alien species. Priority actions include defining clear institutional responsibilities and measures for control and/or eradication of prioritized IAS and development of technical capacity.

Improve plant quarantine

A number of existing rules, regulations and control measures can be used to manage invasive species. Introduction of new species of plants and crops is governed by the *Plant Quarantine Act of Bhutan, 1993* which was enacted to: (i) prevent the introduction of pests not already present or widespread in the country; (ii) control those pests already present by restricting their spread and by endeavouring to eradicate them; (iii) provide facilities for services for import of plants and plant products; and (iv) extend cooperation in the prevention or movement of pests in international trade and traffic. The *Seeds Act, 2000* regulates the import and export of agriculture seeds and prevents introduction of unwanted plants and diseases. It also promotes the seed industry with the aim to enhance rural income and livelihood. Bhutan's *Biosafety Act, 2015*, aims to protect the rich domestic and wild biodiversity of Bhutan, promote the nation's food and nutrition security and safeguard the

animals and human health. Action is needed to strengthen the enforcement of all of these laws, as part of a systematic approach to managing IAS.

Clear harmful exotic trees

The Bhutan Agriculture and Food Regulatory Authority monitors the import of non-native tree species. A start has made in Thimphu on clearing three tree species – *Populus*, *Thuja*, and *Cupressus macrocarpa*, which were previously planted on barren landscapes and near human settlements, but have become invasive. These species are now considered to have a negative impact on water usage and respiratory health, and over 4,000 trees have been felled. In the early 2000s, eucalyptus trees in the country were felled for similar reasons, and only a few are left in the country today. Notifications to cut invasive tree species are issued to Dzongkhags, and the Department of Forest and Park Services provides support to replace felled exotic species with seedlings of native species. Action can be taken to identify Gewogs where exotic trees may be contributing to the drying up of lakes and springs, and implement programs for their eradication and replacement.

STRATEGIC OBJECTIVE 30: PRESERVE DIVERSITY OF CROPS AND LIVESTOCK

	Relevant guidance	Competent authorities
Seeds Act, 2000	Promotes the seed industry with the aim to enhance rural incomes and livelihoods	National Biodiversity Centre; Bhutan Agriculture and Food Regulatory Authority; Ministry of Agriculture and Forests; Dzongkhag Administrations
Livestock Act of Bhutan, 2001	Regulates livestock breeding, health and production to enhance their productivity and prevent diseases	
National Biodiversity Strategy and Action Plan, 2014	Proposes a series of biodiversity conservation actions including on agro-biodiversity	

Strengthen management framework

Bhutan's wide range of indigenous cultivated plants and domesticated animals provides us with varieties that are drought- and pest-resistant in different situations, which may become increasingly important as climatic conditions change. The National Biodiversity Centre has so far recorded 384 landraces of rice, 105 of maize, 36 of wheat, 10 of sweet buckwheat, 11 of bitter buckwheat, 32 of barley, 22 of amaranth and 36 of millet. In terms of Crop Wild Relatives (varieties of these crops, growing wild in nature), around 230 species belonging to 120 genera in 51 families are expected to occur in Bhutan[44]. The country also has a variety of native livestock breeds, for example the endangered Nublang cattle. Action needs to be taken to develop technical and institutional capacities, to improve documentation and conservation of agrobiodiversity, and to strengthen the policy and legal framework for agrobiodiversity conservation.

Promote gene banking

Bhutan is committed to preserving its traditional agricultural biodiversity of crops and livestock, or "agro-biodiversity". In terms of the *National Biodiversity Strategy and Action Plan, 2014*, strategies have been developed for minimizing genetic erosion and safeguarding genetic diversity, including the initiation of Wild Seed banking. The National Biodiversity Centre has conserved over 50 species of traditional crop germplasm and the five species of native livestock in its genebank. The National Biodiversity Centre developed a National Cereal Conservation Strategic Action Plan, 2016 to promote conservation and cultivation of traditional cereal crops and has conserved a total of 2700 accessions. The National Biodiversity Centre has initiated DNA a collection of native livestock species, e.g. Nublang cattle, yak and poultry, and developed a protocal, in collaboration with Department of Livestock for embryo banking. In addition, a total of 10,638

doses of animal germplasm of traditional animal genetic resources were added in the national animal gene bank[45]. Action is needed to extend this work to include additional collection of genetic material.

Promote in situ conservation

As well as ex-situ conservation of genetic material in laboratories and gene banks, it is important to preserve diversity on-farm and in the wild, for example, preserving "crop wild relatives" of commonly farmed species. On-farm conservation of crop genetic resources, was started in 2001 and is being implemented in several Dzongkhags, focusing on building the capacity of farmers for improved livelihoods and increased resilience. In order to promote in-situ conservation of plant genetic resources, the main constraint is the lack of adequate financial resources to implement interventions such as building capacity of farmers and implementing innovative incentive measures to motivate and maximize the livelihood opportunities of farming communities.

On-farm initiatives in animal genetic resources was started in 2007 and focuses on native species of livestock, especially those that are threatened. In order to promote in-situ conservation, support is needed in terms of developing and establishing nucleus farms and providing sustainable incentives to farmers keeping native breeds of livestock

STRATEGIC OBJECTIVE 31: SHARE BENEFITS OF GENETIC DIVERSITY

	Relevant guidance	Competent authorities
Biodiversity Act of Bhutan, 2003	Provides for the conservation and sustainable utilization of biological resources and associated traditional knowledge	National Biodiversity Centre; Ministry of Agriculture and Forests Bhutan Agriculture and Food Regulatory Authority
National Biodiversity Strategy and Action Plan, 2014	Proposes a series of biodiversity conservation actions including on Access and Benefit Sharing	
Access and Benefit Sharing Policy of Bhutan, 2017	Sets out Bhutan's implementation of the Nagoya Protocol on access to and sharing of benefits derived from genetic resources	

Strengthen institutional framework

Bhutan ratified the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization in 2013. The *Access and Benefit Sharing (ABS) Policy of Bhutan, 2015* was tested as an interim policy from 2015-2017, and was formally adopted as a national policy in June 2017. Following this, there have been several initiatives, including setting up an institutional arrangement for ABS regimes, and monitoring protocols. A draft Biodiversity Bill to implement the ABS Policy is in place, along with Regulations. The framework for this was laid with the *Biodiversity Act of Bhutan, 2003*, which explicitly protects traditional rights over traditional knowledge associated with biological resources. In terms of the *National Biodiversity Strategy and Action Plan, 2014*, the country is committed to establishing legislative, administrative and institutional frameworks on Access and Benefit Sharing. Action is needed to increase awareness and understanding of the complex issues involved in accessing genetic resources and sharing benefits derived from such use.

Tap benefits from biodiscovery

As a biodiverse country with far-sighted leadership, with ABS legislation in place, Bhutan has potential to tap significant benefits from biodiscovery research – engaging local

communities and companies in creating a niche for nature-based products in national and international markets. This will build on the model of three successful tripartite ABS agreements already concluded. For example, in 2019 an agreement was reached between state-owned enterprise Menjong Sorig Pharmaceuticals Corporation Limited, the National Biodiversity Centre (NBC) and the Namther Menrig Tshogpa – a community-based group in Langthel Gewog under Trongsa Dzongkhag. In terms of the agreement, the company has been granted access to *Emblica officinalis* (Himalayan gooseberry) and *Sapindus rarak* (soapnut tree) for the production of anti-ageing cream and a natural handmade soap. This access is on mutually agreed terms and conditions, including a 5% share of the gross ex-factory profit annually that will go to the community from the sale of these products, with the NBC maintaining oversight. The community also receive harvesting tools, sustainable harvesting capacity building and a premium price for the raw materials. Action is need to upscale by unlocking similar opportunities where the potential for ABS exists.

Implementation Plan

Strategic Objective	Lead Agency	Key Performance Indicators
SO23: Sustainably manage human-wildlife conflict	Ministry of Agriculture and Forests (Department of Forest and Park Services, Department of Agriculture, Department of Livestock)	Reduce HWC incidences by 50% by 2030 from baseline
SO24: Support sustainably forest management	Department of Forest and Park Services	-Percentage of forest area brought under community forest management by 2030 - No. of households engaged in couumnity forest management
SO25: Conserve Bhutan's biodiversity	Department of Forest and Park Services	-Maintain or increase the population of key focal species from 2019 baseline
SO26: Sustainably the protected areas newtwork		
SO27: Promote sustainable tourism		
SO28: prevent and combat poaching, illegal harvest and trade		
SO29: Prevent spread of alien invasive species	Department of Forest and Park Services	-Maintain the area under protected area network (51.4%) - PA network management sustained by 2030.
SO30: Preserve diversity of crops and livestock	Tourism Council of Bhutan	-Eco-tourism strategy developed by 2030
SO31: Share benefits of genetic diversity	Department of Forest and Park Services	-Incidences of wildlife poaching and illegal logging reduced by 50% by 2030

Endnotes

[1] Department of Forest and Park Services, *2018 Forest Facts and Figures*

[2] Statistics from National Biodiversity Strategies and Action Plan 2014, 6th National Report to the Convention on Biological Diversity, and DoFPS, *2018 Forest Facts and Figures*

Department of Forest and Park Services, *2018 Forest Facts and Figures*

[4] IPBES, *2019*
Global Assessment Report on Biodiversity and Ecosystem Services

[5] The tiger, snow leopard and dhole (Asiatic wild dog) are endangered, while the common leopard is vulnerable

[6] The Rapid Impact Assessment of Rural Development mentioned that 35% of the respondents who faced food shortages, 31% of them cited wildlife damage to crops as one of the main causes (Planning Commission 2007).

[7] Bart *et al*. 2010

[8] Nature Conservation Division, Department of Forests, Ministry of Agriculture, 2008, *Bhutan National Human-Wildlife Conflict Management Strategy*

[9] National Environment Commission, *2016 State of the Environment Report*

[10] Thinley and Lassoie, 2013, *Human-Wildlife Conflicts in Bhutan: Promoting Biodiversity Conservation and Rural Livelihoods*

[11] National Environment Commission, 2016; Royal Government of Bhutan, 2016b). Power transmission lines (9,426 ha) were the most significant, followed by road construction (5,462.04 ha)

[12] Sears *et al*., 2017, *Forest ecosystem services and the pillars of Bhutan's Gross National Happiness*

[13] Fuel wood is also used for industrial production, agro- and forestry products processing, road construction, hospitals, schools, military encampments and monasteries.

[14] Statistics on timber allotment can be found in Department of Forest and Park Services, *2018 Forest Facts and Figures*

[15] These include medicinal and aromatic plants, edible mushrooms, ferns, wild greens; bamboo and cane for local handicrafts; bark and pulp for traditional paper-making; honey and beeswax, resins, sticklac and cordyceps, animal fodder; and leaf litter for farmyard manure production collected from Sokshing (owned by the state but used by the people)

[16] IPBES, *2019*
Global Assessment Report on Biodiversity and Ecosystem Services

[17] Only one of the existing hydropower projects, Kurichhu, has a fish ladder, enabling fish to migrate downriver in their mating season

[18] MOAF, *2016 State of Parks Report*

[19] Gross National Happiness Commission, 2019, *12th Five Year Plan 2018-2023*

[20] Up to 2012, approximately 100,000 tourists visited Bhutan each year, with about half coming from the region. International arrivals have since grown by about 7% a year on average, and regional arrivals have risen by roughly 25% a year, including visitors who enter by road from India. *www.kuenselonline*

[21] In 2018 a total of 274,097 foreign individuals visited Bhutan in 2018, which is an increase of 7.61% over 2017. International leisure arrivals grew by 1.76% to 63,367 over 2017 while arrivals from the regional market grew by 10.37%. Tourism Council of Bhutan, 2019, *Final Draft Tourism Policy*

[22] In 2011 alone, more than 121 people were apprehended crossing the border from Bhutan to India with smuggled timber in large quantities and prosecuted

[23] According to the Bhutan Foundation, www.bhutanfound.org

[24] Statistics from National Biodiversity Strategies and Action Plan 2014, 6th National Report to the Convention on Biological Diversity, and DoFPS, *2018 Forest Facts and Figures*

[25] This was recorded only in five dzongkhags in 2001, but has now spread to 17 dzongkhags, according to the National Biodiversity Centre

[26] Agro-biodiversity can be defined as the variety and variability of animals, plants and micro-

organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic) as well as the diversity of the agro-ecosystems.

[27] Globally, biodiversity tends to occur in inverse proportion to technological and industrial wealth. Corporates and research institutions based in technology-rich developed countries obtain samples of plants, microbes and animals that have their origin in biodiversity-rich developing countries – for research, investigation and development of new products, including pharmaceuticals, biotech products, nutritional supplements, cosmetics, enzymes, and industrial chemicals – often without any benefit accruing to the country of origin, especially to the rural communities who are the stewards of nature.

[28] Full title of REDD+ is "Reducing Emissions from Deforestation and Forest Degradation in developing countries, and the role of conservation, sustainable management of forest and enhancement of forest carbon stocks".

[29] Statistics from Department of Forest and Park Services, *2018 Forest Facts and Figures*

[30] DoFPS, *2018 Forest Facts and Figures*

[31] DoFPS, *2018 Forest Facts and Figures*

[32] Bhutan's 6th National Report to the Convention on Biological Diversity

[33] Most notably the Green Climate Fund, also the Bhutan Trust Fund for Environmental Conservation, EU Technical Cooperation Project, GEF-LDCF, IUCN, PHPA, RDCAP, REDD+ and WWF

[34] BIOFIN Bhutan, *www.biodiversityfinance.net*

[35] In 2018 a total of 274,097 foreign individuals visited Bhutan in 2018 which is an increase of 7.61% over 2017. International leisure arrivals grew by 1.76% to 63,367 over 2017 while arrivals from the regional market grew by 10.37%. Final Draft Tourism Policy, 2019

[36] In a 2011 amendment to the penal code, risking the protected species is upgraded to a felony of the fourth degree

[37] Department of Forest and Park Services, *Forest Facts and Figures 2017*

[38] Department of Forest and Park Services, *Forest Facts and Figures 2018*

[39] In a powerful model in of public awareness promotion in Norbugang Gewog, Royal Manas National Park rangers and international partners worked with health workers and teachers to explain to the villagers that the tigers kept the prey population in control. The monks at the Dhongag Tenpailing monastery further explained that killing other sentient beings would invoke disharmony for the community – and for their children's generation and beyond. They built small prayer and meditation rooms to house converted poachers and were able to persuade 20 men to come forward and give up poaching, followed by a spiritual cleansing ceremony in which they were accepted back by the community. See *www.bhutanfound.org*

[40] Department of Forest and Park Services, *2018 Forest Facts and Figures*

[41] In 2011 alone, more than 121 people were apprehended crossing the border from Bhutan to India with smuggled timber in large quantities and prosecuted

[42] Department of Forest and Park Services, *Forest Facts and Figures 2018*

[43] www.thegef.com

[44] Report by National Biodiversity Centre

[45] 6th National Report to the CBD

Chapter 6:

WAY FORWARD: ENABLING FACTORS

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This document brings together all of the relevant policy and legislation existing in Bhutan into a Draft National Environment Strategy (NES). The Draft Strategy is aligned with the 12th Five Year Plan for the period 2018-2023, and highlights the relevant National Key Result Areas and indicators, to assist in tracking progress on implementing the Strategy (see Chapter 7 for a summary). The Strategy is intended to guide implementation of the relevant policy and legislation in an integrated and strategic fashion, through articulating a set of Strategic Objectives – contained in thematic chapters – Chapter 2 (Land), Chapter 3 (Air), 4 (Water) and 5 (Life). This chapter deals with cross-cutting enabling factors which are needed for all of these Strategic Objectives to be effectively implemented, in line with the FYP and all relevant policies, laws and regulations.

For effective implementation, there is a need for improved coordination and synergies among various Ministries, Departments and agencies at National, Dzongkhag, Thromde and Gewog levels, in the implementation of environment-related plans and programs. Enhancing such coordination is part of the role of the National Environment Commission (NEC), as the highest decision making and coordinating body on all matters relating to the protection, conservation and improvement of the natural environment, cutting across several sectors of government. Where there are currently inconsistencies between different policy instruments, or between policy instruments and legal instruments, it is important that these be brought to the attention of the NEC by the relevant sector of government, or by civil society, in order that such inconsistencies can be addressed through amendments to one or more instruments, in line with the overarching policy framework, guided by the Constitution, as discussed in Chapter 1. The same applies to concerns expressed in relation to overlapping mandates, roles and responsibilities of different government agencies.

This chapter sets out a number of enabling factors which are needed for the Strategic Objectives outlined in Chapters 2, 3, 4 and 5 to be effectively implemented. In addition to the above-mentioned importance of coordination and harmonization of government mandates, enabling factors can be identified in relation to the following areas:

a) Address policy gaps and implementation challenges
b) Improve monitoring, data and information systems
c) Tackle governance and enforcement challenges
d) Strengthen civil society partnerships
e) Promote innovative finance and incentives
f) Utilize economic valuation tools
g) Develop capacity of individuals and institutions
h) Conduct public awareness, education and advocacy
i) Apply science and traditional knowledge to targeted research

a) Address policy gaps and implementation challenges

In the process of conducting consultations at national, regional and dzongkhag level, the National Environment Commission received important inputs from government officials and members of civil society on areas where there may be policy gaps – where new policies, laws or regulation need to be drafted, or new strategies, plans or guidelines developed to address these types of challenges, related to the need:

1. for stricter standards, higher penalties and stronger enforcement capacity in many cases
2. for clarity where there are overlapping or unclear mandates and responsibilities
3. for stronger inter-agency cooperation for effective integrated policy implementation
4. to tackle policy conflicts where these exist and ensure policy harmonization
5. to address ongoing environmental challenges which have not been effectively addressed
6. to address new and emerging environment and climate change challenges.


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A key issue raised in all the regional workshops conducted as part of the consultation process for this National Environmental Strategy relates to a perception that several of Bhutan's existing policy and legal instruments are inconsistent or even contradictory. There are a number of cases where harmonization needs to be achieved – through amendment of an existing policy, development of a new policy, or issuance of regulations or guidelines that clarify and resolve apparent contradictions or tensions. Such a process of harmonization, supported by the NEC and accompanied by clarification of the mandates and responsibilities of different agencies and levels of government, could help achieve cohesiveness, synergy and collaboration between sectors. In particular, the need was highlighted to improve collaboration, cooperation and synergies between the national and local administration and local government. All of this work could form a solid basis for collaboration on implementation, mobilizing new resources and catalyzing actions to address gaps.

The specific set of challenges and gaps identified below may reflect the views of many stakeholders in society, or just of a few individuals. The issues at stake are still under discussion, and there may be a need for societal debate before they can be resolved, and agreement reached on the precise nature of the interventions required. For this reason, a decision was taken to reflect all the new ideas and suggestions raised through the consultation process in this chapter, so that they can be considered and addressed as part of the way forward. The ideas are listed below, as raised during the consultation process, as suggestions for further exploration and action:

Suggestions in LAND theme:

- Recommend amendment of Land Act to allow for equitable land substitute suitable for agriculture in exchange for land provided for farm-road construction
- NLC in collaboration with MoAF to assess, process and approve land exchange/swapping for those land parcels affected or destroyed by natural calamities such as landslides, erosion etc.
- Recommend amendment of Land Act and other relevant legislation to allow for a process to determine land compensation values
- Recommend amendment of Land Act, to prevent arable land lying fallow – ease restriction on wetland with regards to agriculture diversification (allow any feasible agriculture activity, such as horticulture or orchard development, which is restricted currently)
- Recommend amendment of Land Act to

protect potential areas (wetland/paddy)
- Recommend amendment of Land Act to improve mechanism for land leasing
- Provide a clear legal definition of encroachment, and undertake an inventory of state land, doing ongoing monitoring using new technologies, and dealing on a case by case basis with encroachments – regularizing settlements where justified and preventing new encroachments
- Investigate potential for adoption of "climate villages" by the mining sector and large industries
- Revise building rules and regulations, including number of stories permissible
- Develop a comprehensive monitoring and evaluation framework for new settlement plans to ensure compliance with legislation as well as adoption of best practices, e.g. designing for energy efficiency, resilience to earthquake and windstorm etc.
- Implement an extended producer's responsibility approach, with a waste management fund to incentivize private waste management entities and enable innovation through public-private partnerships
- Implement new schemes to encourage 4R waste management, including fiscal incentives to waste collectors
- Conduct research to prepare for recycling and reuse of new kinds of waste streams, including growing e-waste (volume and type) and waste from electric cars
- Conduct an assessment and feasibility study of the potential for a Refuse Derived Fuel approach in cement plants
- Conduct Strategic Environment Assessment for all Dzongkhags, proactively determining the carrying capacity for industrial activities and establishing the likely cumulative impacts of proposed developments
- Revise Mines and Mineral Policy to strengthen environmental assessment and compliance with legislation, including effective post-mine rehabilitation
- Consider establishment of Regional Environment Office in each of Bhutan's four major regions, for better compliance monitoring and also to provide one stop services to the people.

Suggestions in WATER theme:

- Conduct comprehensive study, mapping and inventory of all groundwater resources nationwide – thorough and complete investigations to confirm the depth, presence and sustainability of the groundwater for extraction through videographing or camera test, electrical sounding and other geophysical surveys and hydrogeological studies
- Establish policies to guide groundwater extraction, maximizing opportunities but avoiding over-extraction and other negative potential impacts – groundwater is a common pool resource, therefore the rules and regulations on who gets to extract and how, who will monitor and regulate and how are critical questions to be answered
- Investigate potential to institute ground water recharge systems in the towns
- Establish indicators for monitoring irrigation performance, and define rule for formation and operation of water users' associations more clearly
- Conduct national study to identify and analyse the mismatches between irrigation and other policies and make recommendations to address these
- Develop guidelines to replicate successful Payment for Ecosystem Services (PES) schemes, also linking to revival of water sources through indigenous methods
- Increase taxes on industries contributing to water pollution and/or increase fines for illegal effluent discharge by these industries
- Investigate potential to institute a new, independent and specialized water regulating / management authority to address water conflict and ensure equitable distribution and sustainable management

Suggestions in AIR theme:

- Revise policy on Liquid Petroleum Gas subsidy – explore likely impact of doing away with dual system either by making all LPG subsidized, or by supplying subsidized LPG only in rural areas
- Revise vehicle import tax system, with higher taxes to discourage import of diesel or other high-emission vehicles
- Investigate new system for subsidization of low- carbon emitting cars such as electric cars
- Follow recommendations to set new proposed maximum vehicle emission standards – moving from 4.5% permissible volume of carbon monoxide in gasoline-fuelled vehicle to 1.5% in a transition period and eventually 0.5%, and from 70 Hartridge Smoke Units for diesel-fueled vehicles to 65 HSU in a transition period, and 50 HSU eventually
- Make government fully responsible for Vehicle Emission System, without involvement of private entities
- Revision existing environmental standards for acceptable level of particulate matter in the air, including $PM_{2.5}$ as well as PM_{10}
- Investigate potential to develop a household air quality standard to determine acceptable levels of indoor pollution that do not cause harm to human health
- Investigate potential for fiscal incentives such as tax holiday for industries to invest in adopting cleaner technology
- Strengthen enforcement capacity to detect and prevent open waste burning, including issuing bigger fines for infringement of law

Suggestions in LIFE theme:

- Revise Livestock Act and Policy to reflect development with wildlife endowment for compensating stock loss to damage-causing animals.
- Consider extension of compensation schemes to comprehensively cover crop loss as a result of windstorms and other extreme weather events intensified by disaster
- Improve Wildlife Management System by Department of Forests and Parks to help improve habitat and connectivity and stop encroachment into forests
- Further develop tourism policy to update rules and regulations on regional tourists, entry and exit points, considering change to restrict daily numbers and require advance application for guaranteed entry
- Consider new policy on stray animals, or at minimum revival of nationwide spaying and neutering efforts, to address re-emergence of problematic population levels

b) Improve monitoring, data and information systems

A number of government agencies are responsible for monitoring the implementation of policies, laws and regulations, tracking progress in relation to the current Five-Year Plan, and reporting on Bhutan's compliance with its international commitments in terms of Multilateral Environmental Agreements (See Chapter 1). A comprehensive *Environmental Data Needs Assessment* was completed by the National Environment Commission Secretariat in 2018, setting out all of the country's national and international reporting obligations, and the institutional framework within which reporting takes place. The assessment identifies the primary users of major categories of environmental data, information and statistics, and the needs and challenges faced by user groups, and highlights gaps in data availability and indicator systems.

Inadequate data and insufficient information management are major constraints for the successful implementation of environmental objectives and effective enforcement of environmental legislation. An example can be seen in the key area of air quality monitoring. In the past, a shortage of automatic stations to monitor air quality in strategic locations made it difficult to ensure that emissions and discharges from industries comply with the national environmental standards (see Chapter 3). Detailed baseline environmental information, with the support of

environmental standards, is needed to enable accurate assessment of the level and extent of environmental pollution and environmental changes in the country. Such information is not always available, or parameters are inadequate. In addition, data collection in Bhutan has only recently started in a systematic manner, and the data available are not yet statistically significant to make inferences on long-term trends and causes.

The key challenges reported in the 2018 assessment by the various user groups in obtaining and using environmental data stem primarily from a lack of technical skills and equipment (according to 89% of respondents surveyed for the report), followed by manpower and budget shortages (83%). Other reported challenges include a lack of clear mandates, a lack of good indicators and a lack of uniformity in data collection format and storage. The observation was made that data collected for specific organisational requirements is not readily available to the public, and there is insufficient stakeholder involvement, and coordination between data generators and users.

Specific organizational problems related to data were reported to include:

- overlap of institutional mandates for data generation, which means that often data is replicated in slightly different ways
- a lack of advanced equipment, technical skills and manpower, sometimes lead to inappropriate and erroneous conclusions and less uniformity in analysis and interpretation
- budget limitations for data collection/analysis and lengthy government procedures for accessing funding
- the origin of much environmental data in specific projects, reliant on project personnel and therefore not able to be sustained after project end
- staff turnover and inadequate succession planning, affecting continuity of data generation.

The reliability of the available environmental data is a major concern as the data collected is of varying quality, and thorough quality assurance is not always applied. Incomplete or scarce spatial and temporal coverage of data adds to the concern. Lack of coordination and data sharing protocol further complicate the effective use of environmental data in the country.

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Data suppliers and main challenges (NECS, 2018)

Data suppliers	Data Type	Main Challenges
NECS	Air and water quality, GHG emission, climate Projection, industrial emission	Equipment, fund and capacity
DoFPS	Forest Inventory and Fuel Wood consumption	Equipment, fund and capacity
NLC	Land-use, land use change and Geospatial data of Bhutan	Equipment and fund
DoI	Information on new and existing industrial projects/ activities, waste generation from Industries and Mines	Equipment, fund and capacity
RSTA	Vehicle numbers and emission standards and levels	Fund and capacity
DoT	Petroleum imports and use data	Equipment, fund and capacity
MoWHS	National level waste inventory and water supply data for urban areas	Fund and capacity
Thromdes	Municipal level waste inventory and urban water supply data	Fund and capacity
NBC	Curated species data; Citizen contributed species observation data; inventory data of Plant and Animal Genetic Resources for Food and Agriculture; Gene Bank collection data; National Herbarium data	Equipment, fund and capacity
NSB	Economic & Social Statistics	Fund and capacity
NSSC	Soil and Land management information	Equipment, fund and capacity
NCHM	Water and weather data and climate scenarios	Equipment, fund and capacity
DoPH	Health, Sanitation and rural drinking water details	Equipment, fund and capacity
DPA	Public environmental expenditure	Equipment, fund and capacity
DGM	Geology, earthquake and minerals inventory	Equipment, fund and capacity
DDM	Data on environmental degradation induced disasters	Equipment, fund and capacity
DRE	Energy Audits and data on renewable energy generation	Equipment, fund and capacity
DHPS	Data on Hydropower energy generation and export	Equipment, fund and capacity
RUB	Primary data on the impacts of climate change	Equipment, fund and capacity
RAA	Reports on the effective implementation of MEAs	-
DRC	Annual Trade Statistics; Data on Import of fuels, and other goods and services that are relevant to the environment	-

Some key data needs of government, divided by thematic area, are reported in the 2018 *Environmental Data Needs Assessment*, including the following:

Land

- Land capability and suitability mapping to identify areas that can sustainably support various uses such as agriculture or other development activities
- Information on ecological footprint and local ecological carrying capacity to understand and address ecological degradation issues
- Systematic registration and evaluation of present land use (including state of degradation) and users
- Nature and extent of deforestation
- Nature and extent of land degradation, including soil erosion and its impact on crop productivity
- Information on various soil parameters, including soil fertility and soil organic carbon stock.

Air

- Spatial baseline data on primary and secondary air pollutants needed to assess ambient air quality and its impact on human health and environment
- Accurate estimation of pollution loads from different sources (industry, domestic, vehicles, etc.)

Freshwater Biodiversity

- Data on minimum environmental flows in the rivers, mainly for hydropower projects
- Comprehensive inventory of invasive alien species (IAS) and its ecological value and update the list accordingly
- Baseline information on aquatic species for main river system in the country with particular focus on rivers for which hydropower plants are planned.

Waste management

- Data on solid waste generation categories needed (domestic, industrial, hazardous, hospital, etc.)
- Waste composition data needed to indicate potential for composting and recycling
- Development of an environmental database system for efficient management of municipal waste.

Climate Change

- Historical, and current weather pattern data of the country
- GHG emissions projection
- Impact assessment
- Data on low carbon investment options
- Vulnerability assessment and adaptation options
- Climate change impact on hydropower.

Bhutan is yet to carry out a national-level evaluation of the conservation status of its biodiversity, but key species surveys have been completed for important and threatened terrestrial species – tiger, snow leopard, takin, red panda, golden langur and elephant and small cats. These surveys have enabled habitat mapping and the development of species-based conservation plans. Information on important bird areas, critical wildlife habitats and distribution has been determined. The Bhutan Biodiversity Portal, a consortium-based biodiversity information platform. attempts to document species level information using citizen science approach. Next steps include integrating additional interface to accommodate data on fish and aquatic biodiversity, and initiating prioritization on Aquatic and invertebrates through gap analysis of existing data.

The important relationship between data, monitoring and management objectives can also be seen in relation to forest monitoring. The 2017 report of the Ministry of Agriculture and Forest on *Drivers of Deforestation and Forest Degradation in Bhutan* reported on the comprehensive national forest inventory which assessed the tree stock, ecosystem health, associated biodiversity and carbon stock, which will significantly contribute to decision-making and accessing resources. The Ministry is exploring ways to de-

fine further within high carbon stock/high conservation value forest – demarcating areas suitable for sustainable management, areas suitable for clearing for other land use, and areas suitable for increasing forest cover and carbon enhancement. For example, steep, ecologically sensitive areas could be dedicated to protection to conserve carbon stocks, while afforestation, reforestation and enrichment planting could be promoted in degraded and barren areas. The intensification of sustainable management for timber and forest products would be suitable in forests with higher production potential.

Another example of the link between data and management relates to habitat mapping. Many of the high-biodiversity value habitats such as primary forests, high altitude wetlands, and home-range of flagship species fall within the protected area system. However, some other high-biodiversity value habitats such as Important Bird Areas (IBA), Key Biodiversity Areas (KBA), and Ramsar Wetland Sites rich in crop-wild relatives are yet to be mapped in order to understand their status and to implement appropriate conservation measures. Currently, there is no concrete data to ascertain the rate of habitat loss although land use conversion and forest fire are considered as leading factors. There is a need to map the high-value biodiversity habitats and assess the extent of degradation and fragmentation for appropriate interventions.

c) Tackle governance and enforcement challenges

Because of the cross-cutting nature of environment and development issues, and the framework of Gross National Happiness as an overarching policy objective, the mandates of many different government agencies are touched on by this Draft National Environment Strategy, each of which has a vital role to play in its implementation. A set of relevant competent authorities is identified in the policy table for each Strategic Objective so that the multiple role-players responsible for implementation can be identified at a glance.


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Drawing together this wide-ranging group of government agencies in the context of the new Draft National Environment Strategy is the National Environment Commission (NEC), whose Secretariat has led the process of wide consultations in drafting the Strategy. The NEC was established under the NEPA as the highest decision-making body on all matters relating to the environment and its management. It is a cross-ministerial independent body, chaired by the Prime Minister, with four to five "highest-ranking officers representing relevant ministries" (generally the ministers), nominated by the Chair, and three "eminent persons" or representatives from civil society. The secretariat is responsible for the implementation of policies, regulations, and directives issued by the NEC and for administering the provisions of the NEPA.

The NEC has the authority to designate any ministry, organization, agency, or committee as a competent authority to carry out its functions. The responsibilities of these authorities can range from the development of sector-specific regulations and guidelines (which must be approved by the NEC for formal adoption), issuance of environmental clearances, monitoring of compliance, imposition of penalties within a specified limit, decisions to halt economic activities in cases of noncompliance, and authority to raise concerns with the NEC in environmentally sensitive situations.

On environmental disputes or noncompliance, the NEC can issue fines and/or suspend or revoke environmental clearances in part or whole, thereby halting project activities. If required, it can also call for the establishment of an environmental tribunal to hear specific environmental disputes.

Bhutan has developed comprehensive policies, laws, and regulations to support the management and sustainable use of its environment. It is also broadly recognized that the implementation of these are challenging, and in a number of cases, the intended outcomes are not achieved. According to the ADB (2014) report, the Royal Society for the Protection of Nature (RSPN) stated that "[p]ractical issues contribute to the widening gap between policy and practice." Almost all violations and disputes related to environmental laws and regulations were reported to have been addressed directly by the NEC or competent authorities. These related mainly to illegal use of forest resources, noncompliance with mining and mineral regulations (e.g., lack of mine restoration), poaching, and wildlife trade. Very few environment-related cases been brought before the courts, but this may increase in the future, given the rapid pace of development, with infrastructure expansion, construction, hydropower development, and enhanced extraction of natural resources.

Three draft studies by the RSPN evaluated the detailed impacts of hydropower development, farm road construction, and mining and quarrying activities on the environment. In particular, the studies point to the gaps between policies and implementation and significant impacts of poorly executed EIAs and unresolved regulatory noncompliance. The combination of policy implementation gaps and broader economic development is causing Bhutan to encounter a number of environmental pressures, including land degradation and loss of forest cover, threats to biodiversity, degrading water quality and quantity, increasing waste issues, and air pollution.

The Government of Bhutan has undergone a history of decentralization reforms. In 1981 and 1991, respectively, 20 Dzongkhags and 205 Gewogs were instituted by royal decree. The role, mandate and capacities of local governments in Bhutan have been significantly strengthened in recent years, but challenges remain. A key issue raised in all the regional workshops conducted as part of the consultation process for this National Environmental Strategy was the need to empower local government for more effective enforcement of laws and regulations. In some cases, this will involve strengthening regulatory bodies at Dzongkhag and Gewog levels, improving human resources and technical capacity for carrying out regular monitoring. An example is the ban on the

use of plastic bags. This is a national policy, but Gewog administrations and village Gups (leaders) do not have the power to enforce the ban by imposing fines. If local government is given the responsibility to implement directives from the government, it must also be given the authority to enforce.

Based on discussions held in 2014 by the Royal Government of Bhutan with support of the Asian Development Bank with environment officers within the government, representatives from civil society organizations, and experts in the environmental field, the following governance challenges in Bhutan's implementation of environmental laws were outlined:

- *Ministry coordination:* Poor coordination and collaboration between government agencies was noted as an important challenge in effectively developing and implementing policies and laws. Efforts are underway to harmonize conflicting and overlapping provisions under different environment-related policies and legislation to strengthen horizontal and vertical linkages among institutions
- *Human and technical capacity constraints:* With the rapid pace of development, the number of projects ready for environmental approval has accelerated, presenting challenges for government environment officers who are unable to effectively review, approve, and follow up on compliance, given limited human resources. Limited technical knowledge of officials also makes it challenging to comprehensively assess the impacts of prospective projects on the environment
- *Bureaucracy and related implications:* With numerous procedures and steps required to begin business operations (environmental clearances and others), it was reported that project developers are sometimes urged to bypass rules and regulations, or choose not to comply given the associated high transaction costs and the low risk of inspection or remedial action by authorities
- *Conflicts of interest:* The current delegation of responsibility for issuing environmental clearances and monitoring compliance may present a conflict of interest, given that line ministries and regional authorities usually have a dual responsibility of managing environmental impacts of projects while also pursuing economic development goals
- *Traditional hierarchies:* Bhutan is a relatively small society, which has advantages, but can also present challenges with respect to ensuring an arm's-length approach between private project developers and government authorities. The RSPN states that "Bhutanese society is small and closely-knit wherein most of the people, especially at the bureaucracy and business levels, are known to the other and bound by traditional social obligations. Such relations at the level of the empowered and affluent often get in the way of official undertakings, making policy enforcement difficult."
- *Limited capacity of project developers:* Many private project developers have little knowledge about the potential environmental implications of their desired activities. In submitting requests for environmental clearance, the information they supply is seldom of the required technical and professional level. Professional EIA practitioners are rarely used in undertaking evaluations for small to medium-scale projects. The relevant ministry, the NEC, and district environment officers are therefore required, to the best of their ability and capacity, to either reject proposals or guide project developers in completing their clearance request documents

These challenges have significant implications for the effective implementation and enforcement of environmental policies and laws. Challenges relate not only to effectively monitoring the compliance of existing projects, but also to ensuring that projects receiving environmental clearance are truly environmentally sustainable through the conduct of a scientifically robust EIA process.

d) Strengthen civil society partnerships

Civil society partnerships have been vitally important for Bhutan in piloting and testing many of the new approaches outlined in this National Environment Strategy. They are also critical agents for promoting community awareness – to win public support and involvement, to implement policies on the ground. This includes a range of types of civil society bodies – Bhutanese community-based and non-governmental organizations, international non-governmental organizations (NGOs) with a presence in Bhutan, United Nations agencies, multilateral donor funds, and bilateral partnerships with other governments and their development agencies.

The following alphabetical list of civil society partners is not intended to represent a fully comprehensive list of such partners, nor to exclude, now or in the future, any organization or capacity, but serves to provide a sense of the broad scope of enabling institution whose support has been and will continue to be an important enabling factor for implementation of environmental policy:

Asian Development Bank, Association of Bhutanese Tour Operators, Australian Aid, Austrian Bilateral Assistance, Bhutan Ecological Society, Bhutan for Life, Bhutan Foundation, Bhutan Toilet Foundation, Bhutan Trust Fund for Environmental Conservation, BIOFIN, CIFOR, Clean Bhutan, Climate Investment Fund, CNDP, College of Natural Resources, Danish International Development Agency, European Union, FAO, GEF Least Developed Countries Fund, Global Environment Facility, GEF Nagoya Protocol Implementation Fund, Government of India, Government of Republic of Korea, Green Bhutan Corporation, Green Climate Fund, Greener Ways, Guide Association of Bhutan, Helvetas, Hotel Association of Bhutan, ICIMOD, IFAD, International Finance Corporation, IUCN, Japan Funds-in-Trust, Japan International Cooperation Agency, Joint Research Centre of the European Commission, Karuna Foundation, Nissan Japan, PPD, Radhi Natural Resources Management Group, Royal Society for the Protection of Nature, Royal University of Bhutan, SCI, SNV Netherlands Development Organisation, South Asian Association of Regional Cooperation, Swiss Agency for Development and Cooperation, SWITCH Asia, Taryana Foundation, TICA, UN Environment Program, UNCCD Secretariat, UNDP, UNDP-managed GEF Small Grants Program, UNESCO, University of California, USAID, Water for Women, Waterkeeper Alliance, World Bank, World Health Organization, World Meteorological Organization, World Tourism Organization, WWF Bhutan, WWF International.

e) Promote innovative finance and incentives

Effective implementation of Bhutan's environmental objectives depends on having sufficient financial resources available. Funds may come from a range of sources – public and private, domestic and international, traditional and innovative. During the country's pinnacle policy dialogues every two and half years, a number of innovative financing options have been discussed, such as issuing Green Bonds, e-payments, establishing a new Climate Fund and reforming the tax collection system. The Biodiversity Finance Initiative (BIOFIN) has identified a number of other opportunities, including generating further revenue from ecotourism to re-invest into natural resources, exploring local level financing options, maximising returns from forest carbon stocks, using royalties from hydropower for conservation of watersheds, and capacity development of the judiciary system in applying an effective system of fines and fees through a dedicated "green bench."

BIOFIN's analysis has shown that public funding allocated for the Renewable Natural Resource (RNR) sector in the 11th Five Year Plan (2013-2018) was about USD 65 million, of which around USD 16.83 million was for biodiversity related activities. A tentative estimate of the total funds required for the implementation of the National Biodiversity Strategies and Action Plan (NBSAP) – itself just a sub-set of what is contained in the (Draft) National Environment Strategy – is USD

32.05 million – indicating a funding gap of 15.2 USD million. The ongoing mainstreaming of environmental goals into the Five Year Plan process is a positive trend that needs to be continued. Additional resource mobilization is occurring under the 12th Five-year Plan flagship programs – such as those for water, tourism, highland and organic agriculture.

Building on Bhutan's global commitment to carbon neutrality, and the Constitutional requirement to maintain at least 60% forest cover, significant resources have been mobilised towards the long-term financial sustainability of Bhutan's system of protected areas, preserving these vital carbon sinks. Most notably, the Bhutan for Life initiative, in collaboration with WWF and other partners, has secured innovative financing of USD 43.1 million from private, bilateral and multilateral funding sources, including the Green Climate Fund and the Least Developed Countries Fund of the Global Environment Facility, to permanently finance Bhutan's protected area system. The initiative also includes domestic financing of USD 68 million and another USD 7 million from the Bhutan Trust Fund for Environmental Conservation. The globally innovative Bhutan for Life model, using project finance for permanence, involves a 14-year transition period over which responsibility for PA financing is progressively borne by domestic sources of revenue, enabling full domestic financial responsibility by the end of the period.

Ongoing initiatives supported by international partners include the NAPA III, REDD+ Readiness Program, the Poverty and Environment Initiative, and the Sustainable Consumption and Production (SCP) initiative through the SWITCH Asia Facility. UN agencies such as UN Environment and UNDP are supporting government on a range of projects funded through the Global Environment Facility and the Green Climate Fund including climate-resilient agriculture, sustainable low-emissions urban transport systems, sustainable livelihoods from forest and agricultural landscapes, integrated river basin management, and reducing risk from climate-induced disasters.

In 2018, the Bhutan Trust Fund supported 48 biodiversity projects worth Nu. 228 million. The Bhutan Access and Benefit Sharing Fund has in-


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creased from Nu. 1.6 million to 4.8 million, the establishment of the Endowment Fund of Crop and Livestock Conservation has been approved, and the establishment of a National Climate Fund is under discussion. Payments for Ecosystem Services (PES) is an innovative financing mechanism that has been utilized in Bhutan in specific contexts, and the *National Payment of Environment Services Framework (PES) of Bhutan, 2015* and *PES Field Guideline* have been developed to facilitate PES implementation. At the same time, in addition to existing PES scheme in Yakpugang Community Forest Management Group (CFMG), new PES sites have been established in Pasakha and Namey-Nichu in Paro.

Financial incentives provided by government may influence economic activity and have an impact on the environment that may be positive, negative or neutral. The incentives provided in the renewable natural resources sector (RNR) are mainly targeted at realizing the goals of food and nutritional security, enhancement of rural livelihood and reduction of the high import dependency. The impact of these subsides on biodiversity, land and water resources is yet to be assessed. In the Forestry sector, subsidized timber and the right to collect NWFPs are generally perceived to be harmful since these resources are extracted on an ad-hoc basis from unmanaged forests. The Integrated Conservation and Development Programs is seen as a positive incentive, albeit with sustainability issues. Other relevant policies and fiscal incentives with a positive intent include the income tax holiday of 5 years to farm house/homestay and 10 years to businesses agriculture enterprises; tax rebate to industries adopting environmentally sound technology (EST); sales tax exemption on waste management, mass transport and equipment; subsidies on human wildlife mitigation technologies; and subsidies on stall-fed high-yielding cattle breeds.

f) Utilize economic valuation tools

An important contribution to the enabling environment for implementation of the (Draft) National Environment Strategy comes from the use and application of economic valuation tools to demonstrate the value of the natural environment to human well-being, socio-economic development and overall Gross National Happiness. Currently, the valuation of biodiversity and ecosystem services is not carried out on a systematic basis, but has been carried out in the context of specific initiatives and projects – national capacity building initiatives for REDD+ readiness, Payment for Environmental Services

(PES), National Forestry Inventory, and *ad hoc* valuation of some protected areas and ecosystem services.

As the nationally designated institution for coordinating ecosystem valuation, the Watershed Management Division (***Department*** of Forests and Park Services, Ministry of Agriculture and Forests) has carried out a series of studies on biodiversity and selected ecosystem services i.e., timber, Non-Wood Forest Products, fuel wood, nature based tourism, water, grazing, and species richness. The Economics of Ecosystem and Biodiversity (TEEB) study for selected hydropower plants in the country has been completed establishing three scenarios to simulate changes in ecosystem services provisioning from 2010 to 2030. Several valuation studies carried out in the country were assessed through the implementation of the 11th Five-year Plan, which has mid-term and terminal reviews, in the context of implementation of the country's National Biodiversity Strategies and Action Plan (NBSAP).

Natural Capital Accounting or "greening" of national accounts, is a global tool that is starting to be applied in Bhutan, alongside the system for tracking Gross National Happiness. National accounts are used as the basis for calculating Gross Domestic Product, i.e. the total value of the goods and services produced by a nation. The system used in Bhutan for the calculation of GDP is based upon the methodology and practices recommended by the United Nations (the 1993 System of National Accounts). While the methodology represents a considerable improvement over earlier methodologies, it still takes no account of the value contributed to the economy by the environment and by ecological services. An estimate of this value can be arrived at through the compilation of environmental satellite accounts, for which methodologies have been developed and tested. The objective of "greening" of Bhutan's system of national accounts is to provide us with quantitative indicators of the importance of the environment to our economy and of the sustainability of our development path. In this sense, the greening of our system of national accounts would contribute to the quantification of Gross National Happiness.

The nation's guiding policy document *Bhutan 2020: A Vision for Peace, Prosperity and Happiness*, written in 1999, provides an important caution – that overemphasizing a utilitarian, Western approach to measuring and valuing the contribution of the natural environment could risk swallowing up our own approach to the environment, which has traditionally been anchored in our Buddhist beliefs and values: "We not only respected nature, we also conferred upon it a living mysticism. Places were identified with deities, divinities and spirits, and a large part of the landscape was mapped in such terms in our minds. We must recognize that some of the measures that we have taken to protect and preserve the environment and biodiversity may also have contributed to the erosion. The establishment of nature reserves and protected areas has introduced lines of demarcation between humans and nature that formerly never existed. The introduction of rules and regulations that must be respected have stripped some locations of their mysticism and prevented the communion with nature that was once common. Our belief that we should manage our biodiversity and environment in accordance with international standards may have unwittingly contributed to a hardening of traditional attitudes, perceptions and values. The further erosion of our traditional perception and understanding of our place in natural systems carries potentially disturbing consequences for the environment. It may be a shorter step than we might care to imagine from seeing ourselves as part of a living world to seeing it as a source of wealth and as a resource base to be exploited for immediate gain – a step that would undermine the whole ethos and ethics of conservation. We must be ever conscious of this danger. It can only be addressed by deliberate efforts to keep alive traditional attitudes and values. This establishes a clear link between environmental conservation and the conservation of our cultural heritage."

g) Develop capacity of individuals and institutions

Developing capacity at both individual and institutional level is important to empower citizens and officials to carry out specific activities in fulfilment of the National Environment Strategy and the various policies, laws and regulations underpinning it. Two important constituencies for capacity development are unemployed youth and rural women. Unemployed youth are the recipients of government support to commercial farming ventures – with land user rights certificates issued to them to create job opportunities in farming and agri-processing. Ongoing capacity development is needed to ensure that sustainable businesses are established on this land.

Owing to the matrilineal inheritance practice in large parts of Bhutan, about 60% of rural women and about 45% of urban women have land and property titles registered in their name[1]. Gender equality can be further promoted by giving women a greater voice in the management of the land they own for better business opportunities, and access to an effective secondary and higher education along with skills training[2]. Women can be providers as well as recipients of capacity development activities, since rural women tend to interact closely with the natural resource environment as users of wild plants and forest products. They are also usually the managers of home gardens, and can pass these skills on to the youth.

Development of government officials' capacity through in-service training is also critical for effective policy implementation. A number of partnerships with donors have enabled the Royal Government of Bhutan to develop capacity in specific environmental sectors, such as air quality monitoring, managing human-wildlife conflict, or undertaking forest inventory. Through the Poverty and Environment Initiative, programs have worked to build central and local government capacity to achieve green, inclusive development, through training provided to civil servants from all over the country. This has strengthened national and local level capacity to take into consideration environment, climate and poverty issues when undertaking local and central government's planning.

International partnerships have also made possible programs to enhance the capacity of judges from across Bhutan to review and improve draft rules of environmental adjudication. Programs with other countries in the region have developed capacity of national and local governments to create an enabling legislative, financial and technological environment for the introduction and uptake of environmentally sound technologies in the waste sector, and for achieving their commitments on reducing greenhouse gas emissions. Non-formal education instructors have been trained on a new curriculum related to renewable energy, rainwater harvesting and biogas, delivered through 700 learning centres across the country, as well as receiving training on construction of fuel-efficient, cleaner cookstoves. Capacity development for staff of protected areas has been carried out to strengthen enforcement and anti-poaching operations, including capacity for SMART patrolling.

Aiming to empower local government at dzongkhag and gewog levels, the Joint Local Governance Support Program (JLGSP) has operated over the past decade. The program aims to make finance systems effective and transparent for local government service delivery, while strengthening the central government's policy, regulatory, supportive and supervisory functions. Its strategy includes assisting local governments in implementing block grants allocated for improving local-level infrastructure and in providing public services, while offering training and capacity development for local personnel and officials. In this context, a Capacity Development Grant Mechanism for local government (LoCAL) provides adaptation grants to local governments to support climate resilient investments, such as:

- Infrastructure works aimed at the improvement of farm roads for enhanced climate resilience – this involved slope stabilization of landslide-vulnerable areas, rectification

and improvement of the drainage system and construction of a causeway
- Construction of elevated bridges to overcome risks posed by swollen rivers and streams during heavy rain events
- Improvement of rural water supply schemes – this involved tapping new/ additional water sources, protecting water sources and their enhancement through planting water-conserving species, upgrading water tanks to increase storage capacity, or replacement of water supply lines with climate-resilient materials
- Improvement of irrigation systems by rehabilitating irrigation channels and installing climate-resilient pipes to distribute irrigation water
- Soil conservation and landslide risk mitigation works, such as planting bamboo plants and constructing drains in landslide- prone areas or farms
- Equipment provisions for renewable energy use through installation of biogas producing plants and bio-digesters or solar lamps/panels.

h) Conduct public awareness, education and advocacy

Public education and awareness are vital to ensuring care for Bhutan's rich natural and cultural heritage. According to the Constitution, every Bhutanese is a trustee of the Kingdom's natural resources and environment, for the benefit of present and future generations, and it every citizen's duty to contribute to protection of the natural environment, conservation of the rich biodiversity and prevention of all forms of ecological degradation. The integration of biodiversity and environment into the Gross National Happiness surveys reveals how ecological indices can be used in national development paradigms. *The Gross National Happiness Survey, 2015* indicates that close to 80% of the total population are highly responsible (among 4 ratings - not at all responsible, a little responsible, somewhat responsible, and highly responsible) towards biodiversity conservation.

Conducting advocacy and awareness efforts around specific areas of environmental policy, legislation and regulations can be essential for their effective implementation, and to minimize infringements and environmental damage. Efforts to ensure knowledge and understanding of particular policies provide the first step towards ensuing both support and cooperation on proactive environmental management efforts, and compliance with environmental legislation.

Public environmental awareness raising starts within the context of schooling in Bhutan, with all teachers trained to explicate Gross National Happiness, as well as the related concept of "greeneries" – essentially natural, intellectual, academic, social, cultural, spiritual, aesthetic and moral values. Environmental education is mainstreamed into the school curriculum from Pre-Primary to Higher Secondary. Environmental education is


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further supported by NGOs like the Royal Society for the Protection of Nature (RSPN) which works to impart environmental knowledge and skills among the youth and citizens for promoting positive attitudes and sustainable actions in conserving Bhutan's rich environmental heritage. Working in close collaboration with the Ministry of Education, RSPN's Environmental Education Program has developed an extensive network of Nature Clubs, covering more than 23% of the schools and colleges in the Kingdom, and working closely with the Ministry of Education.

Beyond school level, awareness and outreach programs are carried out in the major cities and at Gewog level on biodiversity conservation and environmental protection and waste management. Advocacy and capacity building for disaster management are carried out through awareness raising and promotion of early warning systems. In some areas, communities are also engaged in citizen science initiatives to monitor species and ecosystem health. Additionally, community mobilization events continue to be promoted, for example, undertaking litter collection, river clean-up, tree planting etc. Public biodiversity information generation and access platforms are being enhanced, while nature clubs and youth engagement initiatives continue to expand.

Currently, about 66% of the population interacts directly with protected areas, with many people regularly visiting the forest for spiritual and recreational purposes. Environmental education is part of the management of protected areas, as mandated by law. However, these programs are ad hoc and are mostly limited to raising awareness on environmental rules and regulations or a basic understanding of environmental challenges. There are also a number of ongoing environmental education programs targeting different sections of the population. However, an institutionalized mechanism is lacking to ensure that the public understanding of their role in environmental conservation is elevated. Existing environmental education programs should be strengthened to target the general population, including schools, institutions, private and corporate sectors.

i) Apply science and traditional knowledge to targeted research

Many areas of policy implementation covered in the National Environment Strategy can be guided by targeted research, informed both by science and by traditional knowledge. Examples raised during the regional workshops conducted as part of the consultation process for the Strategy relate to the impacts of land conversion (to guide potential amendments to the Land Act) and the prevalence and causes of drying up of water sources, since much discussion of this matter is currently based on anecdotal evidence rather than accurate statistics.

For effective implementation of the National Environment Strategy, there is a need to strengthen biodiversity and environment information and

research, promoting evidence-based policy and decision-making, and adoption of sustainable technologies and approaches. Despite Bhutan's unquestionable commitment to conservation of its natural heritage, there has been a significant lag in terms of generating and applying science-based knowledge and technologies related to biodiversity, nature conservation, and sustainable consumption and production. In the biodiversity sector, this gap has been recognized since the formulation of the first Biodiversity Action Plan, as well as in subsequent national documents on biodiversity management. Efforts are underway now to build collaborative initiatives with international/regional conservation agencies to enhance technical expertise, knowledge, resources and funds availability to bridge the biodiversity information gap. This could result in holistic and integrated research programs that generate information for government decision-making, policy changes, awareness and education. In terms of adoption of environmentally friendly technologies, there is still an overall gap in the transfer, dissemination and adoption of useful technologies, and there is a need to bridge the gap between policy research and policy formulation.

There are several ongoing studies through universities and NGOs to generate knowledge on environmental issues and biodiversity, including a diverse range of topics. An example of a cross-section of current research projects could include: population abundance and distribution of the endangered golden langur, the impact of changing monsoon patterns on rice production, community values and perceptions of ecosystem services of high-altitude old growth oak forests, and the impacts of air pollution on children's respiratory health. Many NGOs now have knowledge-based conservation strategies, using research to professionalize conservation interventions and also to enrich Bhutan's knowledge base on its environment, producing publications and documentaries for public consumption. The Jigme Khesar Environmental Research Fund aims to strengthen science-based research capacity of Bhutanese individuals through its research grant program.

In addition to a science-based approach, there is political good will and government support for an inclusive and participatory approach to the integration of traditional knowledge and customary practices held by communities in biodiversity conservation and sustainable utilization. However, the process has been slow due to limited human, technical, legal and financial resources. In line with the increasing importance of traditional knowledge associated with genetic resources, in the context of Bhutan's commitment to the Nagoya Protocol on Access and Benefit-Sharing (ABS), Government has initiated a program of work to document, protect and utilise traditional knowledge and customary practices of communities, relevant to biodiversity conservation and sustainable use, supported through inventory and documentation in all 205 gewogs completed with 716 traditional knowledge holders entered in the traditional knowledge database. Over 1,800 plants associated with traditional knowledge have been collected and processed at the Bioprospecting lab for further research, scientific validation and natural product development, and four ABS agreements signed with local communities for the development of eight products utilizing Bhutanese genetic resources and/or associated traditional knowledge (see Chapter 5).

Endnotes

[1] Kotikula, Aphichoke. 2013. *Bhutan gender policy note (English)*. Washington, DC: World Bank Group – report prepared by the World Bank in collaboration with the National Commission for Women and Children (NCWC)

[2] Kotikula, Aphichoke. 2013 (World Bank and NCWC).

CONCLUSION AND MONITORING PROGRESS

Over the past year, the National Environment Commission (NEC) Secretariat has worked with government and civil society stakeholders and partners at national, regional and local levels, to articulate a National Environment Strategy, based on all of Bhutan's existing environmental policies, laws and regulations. This work has received generous financial and technical support from the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP), and also financaial support from UNDP-Bhutan and has been guided by a Task Force set up to represent all the government agencies involved in the work of the NEC, as well as key other stakeholders. The Task Force met in June and October 2019 and formed four technical working groups – one to guide each of the Strategy's thematic chapters on Land, Air, Water and Life.

The Task Force was mandated to produce a high-level strategy document, that would build on the 1998 National Environment Strategy, *The Middle Path*, reflecting new achievements, commitments and challenges. It would also draw on the draft environment policy developed in 2015, and would provide an overarching strategy for integrated implementation of existing national environmental commitments and priorities. The new National Environment Strategy would provide a framework for monitoring progress and was intended to be used to guide actions by government at national, dzongkhag and gewog levels. The Task Force would consider two options in terms of the time framework: a 10-year horizon or alignment with the Five Year Plan period. A first draft of the document was produced in August 2019, and comments and suggested edits were provided by the technical working groups.

Between the two Task Force workshops, consultation was also undertaken with a range of stakeholders at sub-national levels, with four regional workshops held in Wangduephodrang, Bumthang, Phuentsholing and Trashigang. All 20 Dzongkhags were represented in the workshops, including the Chairman, local government of all Dzongkhags, Village leaders (Gup), Community representatives, Representatives from Forest Sector, Representatives from Agriculture Sector, Representative from Livestock Sector, as well as NECS staff members. Extensive comments were made on the first draft Strategy document, and many additional issues raised for inclusion from the sub-national perspective. This enabled the production of a second draft, which was then workshopped in some detail at the October Task Force meeting. Parallel sessions of the four technical working groups were held, refining each chapter of the Strategy, including policy updates and drafting Implementation Plans. These draft Implementation Plans, with potential key indicators for each Strategic Objective which are shown in draft form at the end of each thematic chapter in the current final draft.

Building on this process, the current draft includes a proposed outline for an overall Implementation Plan, potentially including all the 113 Sub-objectives as well as the 31 Strategic Objectives, for consideration by the Task Force and stakeholders. The first draft of this National Environmental Strategy was developed in alignment with the 12th Five Year Plan, and had a limited time horizon of five years. Following the second Task Force workshop, held in Paro in October 2019, it was decided to extend this to a 10-year horizon in the current draft. It is intended that this Strategy be used for a 10-year period from 2020 to 2030, with a full review of the document after five years, for any necessary revisions, building on the progress assessment in relation to the Implementation Plan.

The table presented in Annex I has been prepared as a starting point for revising the Draft Implementation Plans developed by the Task Force technical working groups into a single consistent format, and considering the inclusion of the Sub-objective level as well. The table could be included in the Final Draft of the National Environmental Strategy or kept as a complementary standalone document.

ANNEX I: GUIDING THE MONITORING OF THE NATIONAL ENVIRONMENT STRATEGY

Strategic Objectives and Sub-Objectives	Reporting Agency	Selected Indicator	Baseline in 2020	Target for 2025	Target for 2030
LAND					
***Strategic Objective 1*: Plan for balanced land use**					
• Lease out state land strategically					
• Strengthen environmental impact assessment					
• Establish land use and governance system					
• Ensure optimum utilization of arable land					
***Strategic Objective 2*: Enhance disaster preparedness and response**					
• Plan for disaster risk management					
• Adapt to climate change impacts					
• Strengthen disaster preparedness and response					
• Issue early warnings to vulnerable communities					
***Strategic Objective 3*: Combat land degradation**					
• Plan for Land Degradation Neutrality					
• Reduce land degradation					
• Practice sustainable land management					
• Restore degraded landscapes					
***Strategic Objective 4*: Promote environmentally friendly and climate-resilient roads and infrastructure**					
• Climate-proof transport infrastructure					
• Construct environmentally friendly roads					
• Plan farm roads better					
***Strategic Objective 5*: Make agriculture sustainable and climate-resilient**					
• Protect agriculture against climate change					
• Provide adequate irrigation					
• Improve farm productivity					
• Reduce open grazing of livestock					
• Promote organic farming					

Strategic Objectives and Sub-Objectives	Reporting Agency	Selected Indicator	Baseline in 2020	Target for 2025	Target for 2030
• Maximize use of sustainable inputs					
***Strategic Objective 6*: Manage mineral extraction sustainably**					
• Strengthen protection and regulation regime					
• Plan sustainably for the sector					
• Increase value addition to minerals					
***Strategic Objective 7*: Ensure green, sustainable settlements**					
• Promote regionally balanced development					
• Plan settlements within carrying capacity					
• Make cities climate-smart					
***Strategic Objective 8*: Strengthen waste prevention and management**					
• Build capacity for integrated waste management					
• Promote sustainable production and consumption					
• Improve municipal waste management					
• Minimize greenhouse gas emissions from waste					
AIR					
***Strategic Objective 9*: Remain carbon neutral**					
• Maintain forest carbon sink					
• Plan low-carbon sectoral development					
***Strategic Objective 10*: Improve ambient air quality**					
• Address causes of pollution					
• Reduce pollution from fires					
• Improve air quality monitoring					
***Strategic Objective 11*: Promote low-emission transport**					
• Monitor environmental impact of transport sector					
• Improve public transport					
• Tighten vehicle emission controls					
• Use legal and fiscal instruments					

Strategic Objectives and Sub-Objectives	Reporting Agency	Selected Indicator	Baseline in 2020	Target for 2025	Target for 2030
***Strategic Objective 12*: Adopt cleaner technology**					
• Enforce requirement for environmental approvals					
• Promote investment in clean technology					
• Encourage sustainable consumption					
***Strategic Objective 13*: Develop renewable energy sector**					
• Diversify renewable sector					
• Ensure energy access for remote communities					
***Strategic Objective 14*: Improve energy efficiency**					
• Increase efficiency to reduce emissions					
• Achieve sectoral targets for savings					
• Promote sustainable construction					
***Strategic Objective 15*: Reduce household air pollution**					
• Implement pollution abatement					
• Roll out improved cookstoves					
• Switch to cleaner fuels					
***Strategic Objective 16*: Provide early warning for windstorms**					
• Manage increased windstorm risk					
• Respond to windstorm disasters					
• Provide early warning of storms					
WATER					
***Strategic Objective 17*: Institutionalize and implement integrated water resource management**					
• Strengthen and capacitate IWRM institutions					
• Improve integrated service delivery					
• Manage water resources for a changing climate					
***Strategic Objective 18*: Prevent freshwater pollution**					
• Strengthen enforcement of effluent discharge standards					
• Improve sewerage treatment facilities					

Strategic Objectives and Sub-Objectives	Reporting Agency	Selected Indicator	Baseline in 2020	Target for 2025	Target for 2030
• Monitor drinking water quality					
• Intensify urban clean-up campaigns					
Strategic Objective 19: **Improve access to safe drinking water and sanitation**					
• Rejuvenate rural water sources					
• Promote climate-resilient water harvesting, storage and distribution					
• Expand water and sanitation facilities					
Strategic Objective 20**: Prevent damage from flood disasters**					
• Integrated approach to flood risk management					
• Extend flooding early warning systems					
• Prevent landslides from floodwaters					
• Manage risks of glacial lakes					
• Artificially lower glacial lake levels					
Strategic Objective 21**: Ensure sustainable development of hydropower**					
• Expand current hydropower capacity					
• Protect and manage upstream watersheds					
• Promote alternative renewable energy					
• Carry out cumulative impact assessments					
• Ensure environmental flows in rivers					
Strategic Objective 22**: Ensure efficient use of water resources**					
• Manage water demand					
• Adopt water-saving technologies					
• Raise community awareness					
• Efficiency in water resource use					
LIFE					
Strategic Objective 23: **Sustainably manage human-wildlife conflict**					
• Implement strategy to manage conflict					
• Improve understanding through research					

Strategic Objectives and Sub-Objectives	Reporting Agency	Selected Indicator	Baseline in 2020	Target for 2025	Target for 2030
• Create safe environment for communities					
• Manage wildlife habitat					
• Strengthen community-based crop and livestock compensation					
Strategic Objective 24: **Support sustainable forest management**					
• Maintain forest for climate adaptation and mitigation					
• Promote climate-smart forest management					
• Reduce forest fire					
• Strengthen social forestry					
• Promote Payments for Ecosystem Services					
• Encourage sustainable harvesting					
Strategic Objective 25: **Conserve Bhutan's biodiversity**					
• Implement biodiversity strategies and actions					
• Protect terrestrial ecosystems					
• Maintain freshwater habitats					
• Conserve threatened species					
Strategic Objective 26: **Sustain the protected areas network**					
• Implement Bhutan for Life					
• Diversify conservation finance					
• Improve management effectiveness					
• Conserve transboundary and cultural landscapes					
Strategic Objective 27: **Promote sustainable tourism**					
• Grow sector within carrying capacity					
• Diversify and spread tourism offering					
• Enhance livelihoods through ecotourism					
• Promote sustainable consumption					
Strategic Objective 28: **Prevent and combat poaching, illegal harvest and trade**					
• Prevent illegal hunting and fishing					

Strategic Objectives and Sub-Objectives	Reporting Agency	Selected Indicator	Baseline in 2020	Target for 2025	Target for 2030
• Prevent illegal extraction from forests					
• Develop ranger capacity					
• Enhance international cooperation					
Strategic Objective 29: **Prevent spread of alien invasive species**					
• Strengthen management system					
• Improve plant quarantine					
• Clear harmful exotic trees					
Strategic Objective 30: **Preserve diversity of crops and livestock**					
• Strengthen management framework					
• Promote gene banking					
• Promote in situ conservation					
Strategic Objective 31: **Share benefits of genetic diversity**					
• Strengthen institutional framework					
• Tap benefits from biodiscovery					

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We are thankful to the United Nations Economic and Social Commission for Asia and the Pacific who provided technical and financial support for the development of the Strategy and facilitated the coordination with all other UN agencies.

We are also thankful to UNDP-Bhutan for their financial support.

We are most grateful to the National Environment Strategy Task Force and associated members, composed of representatives of various Ministries, civil society organisations, private sector and United Nations Agencies. This includes the United Nation's Resident Coordinator in Bhutan, as well as to the Secretariat of the 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP) and to Local Government Elected Leaders who contributed in successful development of the strategy.

Designed & Printed : Yoebar Prints (yoebarprinters@gmail.com), Thimphu

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