ནུས་ཤུགས་དང་རང་བཞིན་ཐོན་སྐྱེད་ཚན་པ།
ནགས་ཚལ་དང་སྐྱོང་ཀ་ཞབས་ཏོག་ལས་ཁུངས།

Ministry of Energy and Natural Resources
Department of Forests and Park Services

Key Biodiversity Area Lafeti Khola, Samtse

Bazzania bhutanica

Conservation Action Plan
(July 2023 to June 2033)

Divisional Forest Office, Samtse

Royal Government Endorsement and Approval

Lafeti Khola Biodiversity Area Conservation Action Plan 1st July 2023 – 30th June 2033.

"In accordance with and as per the provisions of the Forest and Nature Conservation Act of Bhutan, 1995"

Submitted for Approval

Chief Forestry Officer
Divisional Forest Office, Samtse

Forwarded for Approval

Chief Forestry Officer
Nature Conservation Division

Approved by

DIRECTOR
Department of Forests and Park Services

FOREWORD

Bhutan's rich biodiversity has been secured by the network of protected areas for the past many decades. However, the state of forests and biodiversity are equally rich beyond the protected areas in Bhutan. On the contrary, the areas beyond protected areas faces considerable threats from anthropogenic disturbances and economic development, and this poses risk to many globally threatened habitats and species found therein. Across the globe, such areas of conservation significance have been addressed by the "other effective area-based conservation measures" or OECMs, an area set aside towards achieving the long term and effective in-situ conservation of biodiversity outside of protected areas. OECMs complement protected areas through sustained, positive conservation outcomes, even though they may be managed primarily for other reasons.

The Key Biodiversity Areas (KBA) in Bhutan, at a global scale is part of the OECMs and is, therefore, adopted towards securing conservation of areas and species that are of conservation significance in Bhutan. Of the many potential KBA sites in the country, the Department has identified and prioritized 11 sites in various Divisional Forest Offices, that requires urgent conservation interventions. For these 11 sites, key interventions have been identified, and has been and is being presented in this conservation action plan as per the guidelines on KBA. The KBA sites classified will serve as in-situ conservation of biodiversity beyond the protected areas.

These classified KBAs are expected to bring in improved conservation outcomes, that are crucial for the functioning of the environment through the provision of essential ecosystem services. It is essential for the processes that support all life on Earth, including humans. These KBAs are expected to address the issues of biodiversity loss and ecosystem degradation due to threats such as pollution, overexploitation of natural resources, introduction of invasive species and habitat loss.

I am happy to note that we continue to prioritize conserving our natural resources, while balancing ourselves with the need to economically develop the nation. I applaud all concerned officials from the Department for coming up with this conservation action for the first set of KBAs classified in the country and wish you all success in implementing the actions.

(Lobzang Dorji)

Director

Acronyms

BTFEC	Bhutan Trust Fund for Environment Conservation
CE	Critically Endangered
DoFPS	Department of Forest and Park Services
DFO	Divisional Forest Office
FNCA	Forest and Nature Conservation Act
FNCRR	Forest and Nature Conservation Rules and Regulations
IKI	International Climate Initiative
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Areas
masl	meter above sea level
M&E	Monitoring and Evaluation
NCD	Nature Conservation Division
NWFP	Non-Wood Forest Produce
WWF	World Wildlife Fund

Table of Content

CHAPTER 1: INTRODUCTION

Background

Key Biodiversity Areas (KBAs) are special sites that host significant biodiversity, with the presence of species that are globally threatened and of conservation interest. In Bhutan, the concept of key biodiversity area was initiated in 2005 with support from Critical Ecosystem Partnership Fund's (CEPF) project dedicated to Eastern Himalayan Region for ecosystem profile (DoPFS, 2021). In Bhutan, KBA approach mainly focuses on areas outside of Protected Area Networks, which have significant persistence of biodiversity at the global and national level.

The Lafeti khola ravine at Buduni under Samtse Dzongkhag is one of the sites recognized as KBA in Bhutan. The site is home to one of the critically endangered species of liverwort known as *Bazzania bhutanica* N. Kitag. & Grolle (Kitagawa & Grolle, 1986). In general, there is limited literature available about studies conducted on bryophytes in the country. The record on liverwort species in Bhutan was first reported by Mizutani in 1967, who highlighted six species of *Bazzania***.** Later, it was noted that three of these records were erroneous and originated from Kalimpong District of West Bengal, India (Long et al., 2009).

According to the checklist prepared by Long and Grolle in 1990, there are fourteen *Bazzania* species in Bhutan of which *Bazzania bhutanica* is critically endangered due to its current status of finding from only one location and due to high threats from human activities. The specimen of the species was first collected by David. G. Long in the early 1980s and was later identified by Kitagawa and Grolle as a new species (Kitagawa & Grolle, 1986)

The site of the species at Lafeti khola under Buduni is located between the two villages of Goenpazor and Khandothang under Samtse Gewog. The studies conducted by (Long et al., 2009) found a second colony of the species in the steep slopes and ravine of Lafeti khola in addition to the original locality at Buduni. Although there are no reports of the species from other parts of Bhutan it was discovered in the West Siang District of Arunachal Pradesh State of India in 2014 (Singh & Singh, 2014). The closest resemblance of the species is known to be *Bazzania scalaris* which is found in Papua New Guinea (Meagher, 2006).

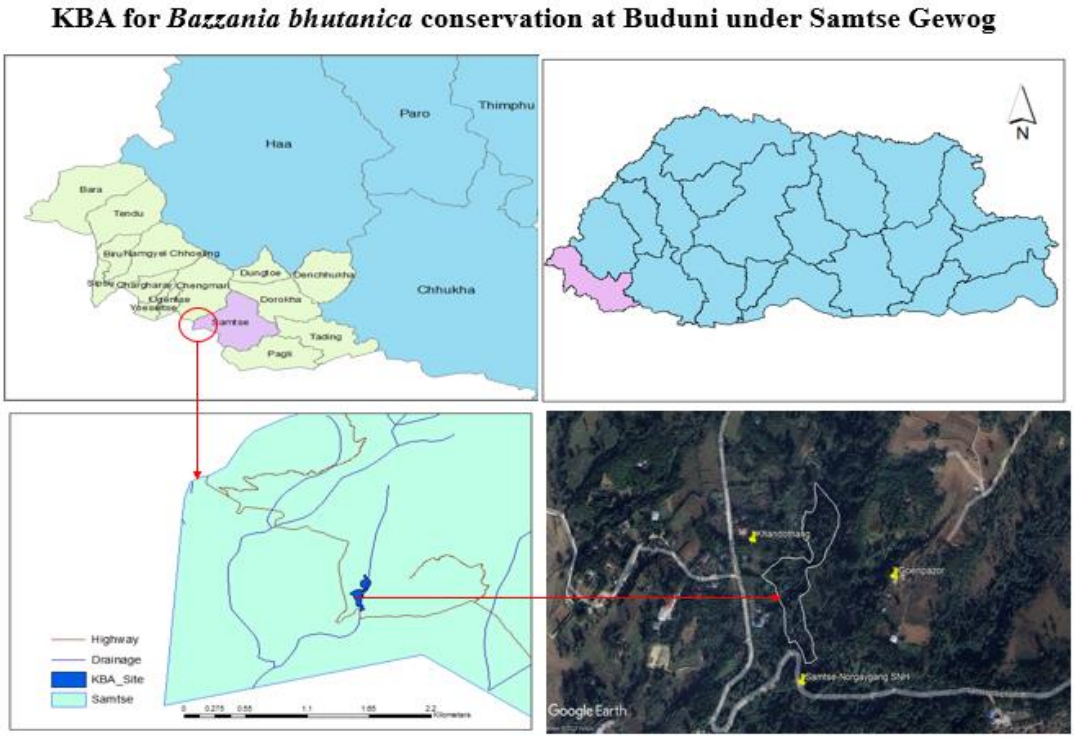

Figure 1: *Location and map of KBA site*

Currently, *Bazzania bhutanica* has only been recorded from a small location in Samtse district of Bhutan (Long et al., 2009) and West Siang District of Arunachal Pradesh, India (Singh & Singh, 2014). Since then, no further locations of the species have been discovered. The species is listed as critically endangered, and the population trend is stated as 'Unknown' by the International Union for Conservation of Nature (IUCN) (Long et al., 2009; Singh & Singh, 2014). The Lafeti Khola KBA site (26.908842° N, 89.064382° E) is located just above the Samtse-Tashicholing Secondary National Highway. The KBA is surrounded by private registered land and covers a total area of 4.60 acres. The species is found within approximately 112 m x 2 m stretches of its habitats.

Figure 2: *Bazzania bhutanica a critically endangered liverwort species found in Samtse*

CHAPTER 2: THREATS AND CHALLENGES

2.1 Treats Identification

According to current records, the habitat of *Bazzania bhutanica* has only been discovered in Buduni under Samtse Gewog in Bhutan. The rare and endemic species' habitat is surrounded by settlement and anthropogenic activities, posing challenges to its conservation. During the site assessment, it was found that the species is found only in small patches. Some of the pertinent threats to its conservation are habitat loss due to forest degradation from firewood and fodder collection, as well as overgrazing. It has been observed that the removal of trees and shrub cover results not only in the destruction of shade but also reduces humidity, which is vital for the species' survival (Long et al., 2009). Other threats include the risk of habitat destruction from developmental activities owing to its proximity to Samtse Industrial Estate. There is also a high risk of the site converting into urban development with the expansion of Samtse town, including possibilities of water tapping from sources near the site with the growing population in the future, which may seriously affect the habitat. Other probable threats also include climate change, which may affect in terms of shifting rainfall patterns, temperature,

2.1.1 Habitat degradation

Conservation of any species demand minimal disturbance of its habitat. The habitat for *Bazzania bhutanica* is found susceptible to disturbance from anthropogenic pressures such as land use changes, clearing of trees and shrubs, dumping of waste, and road construction. These activities have resulted in degradation and fragmentation of the habitat. The KBA is located very close to Samtse Gewog Center and within a few meters of the Samtse-Sipsu highway.

As the site is also located near Goenpazor and Khandothang villages, the people of these villages depend on the forest for grazing and fodder collection. The people of the locality also depend on the site for collection of firewood and timber harvest. Over time, with rising population and development activities pressure on the resources has been growing.

The KBA for *Bazzania bhutanica* is found at deep gorges and ravines and it is highly susceptible to slides and erosion. Human activities over time have resulted in reduction of tree and shrub cover. Monsoons are characterized by swollen streams and flashfloods eroding much of surface layer. The impacts from slides and flash floods increase with human activities at the site.

2.1.2 Collection by people in future

Although there is no current collection of the plant by people, there is a high risk of harvesting in the future due to its rarity. Currently, there are no legal restrictions on the collection of the species. Since the presence of the species is limited to a small area, it is highly threatened by private collection, which poses a significant challenge to its conservation.

2.2 Challenges

2.2.1 Inadequate knowledge

There are limited studies and literature available on the ecology and distribution of *Bazzania bhutanica*. Long et al. (2009) noted that *Ailanthus grandis, Bombax Ceiba, Pterospermum acerifolium, Shorea robusta, Terminalia myriocarpa* and *Tetrameles nudiflora,* dominate the vicinity of the area which is typical of subtropical forest. The local people are least aware of the existence of the rare critically endangered species, there are challenges in getting strong support for its conservation.

2.2.2 Geographical location

The KBA area is situated within a radius of 50m from the Gewog center and a few meters from the highway. Samtse Gewog is one of the commercial hubs for the people of the Dzongkhag and the bordering Indian town. Developmental activities are expanding at an expeditious rate, swamping all pockets of the SRF area. Over the last few years, forest cover near the KBA has been converted to many developmental activities, such as the establishment of private firm called Greener Way and a Logging Depot of NRDCL.

Threats Ranking

To understand the severity of threats to the KBA, the threat ranking was done using Miradi tools. Two threats have been identified in association with habitat of *Bazzania bhutanica.* Habitat degradation at Lefiti khola was ranked high in the assessment. There are many causes of habitat degradation attributed to both anthropogenic and natural causes. Man-made causes include cattle grazing, collection of firewood and fodder, and development activities in the surrounding areas. Natural threats include flash floods and landslides during the monsoon, which increase in intensity due to forest degradation. The other threat is the potential risk of population loss due to illegal collection for ornamental and commercial purposes in future.

To protect the small and critical habitat, the available and feasible area has been captured under management regime. The area is also home to many wild animals such as *assamese macaque*,

barking deer, wild pigs, indian python, cobra, Indian peafowl, and occasionally visited by asian elephants (*Elephas maximus*). The focus has been to conserve the habitats of the rare liverwort species.

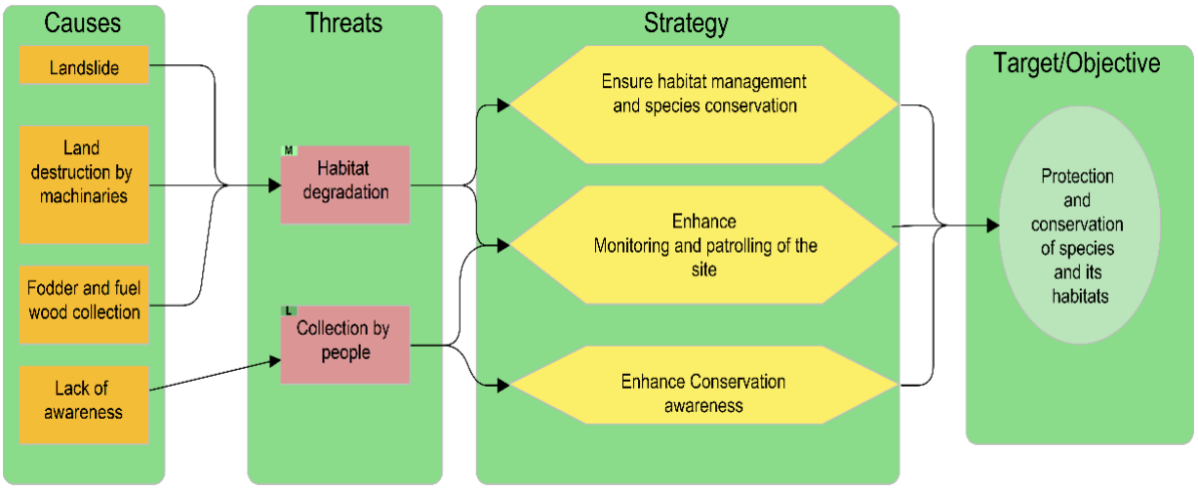

Figure 3: *Threat analysis framework*

Table 1: *Miradi table of threats for each target ranked based on scope, severity, and irreplaceability*

Threats \ Targets	Protection and conservation of species and its habitats	Summary Threat Rating
Collection by people	Low	Low
Habitat degradation	High	Medium
Summary Target Ratings:	Medium	**Overall Project Rating** High

CHAPTER 3: INTERVENTIONS/PLANS

V**ision**: Ensuring the protection of *Bazzania bhutanica* and its habitat and generate data on its ecology.

Objective: Protect and conserve the species and their habitats.

A total of **Nu. 0.74 million (Ngultrum Seven Lakhs Forty Thousand)** only will be needed over the 10-year plan period for the implementation of the planned activities. Although the funding source is not yet secured the Divisional Forest Office shall explore the budget from RGoB, and other donor agencies such as BTFEC and WWF-IKI projects.

Any unforeseen issues that may arise or any interventions that could be carried out in later stages of the plan shall be resolved, identified, or implemented in consultation with the relevant stakeholders.

Table 1: Implementation framework

Objective	Strategy	Action	Yearly budget outlay (in Million Ngultrum)										Total
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Protection and conservation of species and their habitat	Ensure habitat management and species conservation	Plantation of associated shade bearing tree species		0.10									**0.10**
		Install physical barrier (bio-fence) to deter human & other wildlife trespassing to the critical habitats		0.05									**0.05**
		Procure high magnifying hand lens and other accessory equipment.			0.05								**0.05**
		In situ conservation of species through development of trial plots /demonstration			0.10								**0.10**
		Plantation maintenance & Demonstration plots			0.02	0.02	0.02	0.02					**0.08**
		Fencing with barbed wires for in situ conservation demonstration plots			0.10								**0.10**
		Initiate community-based conservation actions to enhance law enforcement system	0.05										**0.05**
	Waste Management	Installation of waste bins				0.05							**0.05**
	Enhance Conservation Awareness	Installation of Signages	0.02							0.02			**0.04**
		Community/stakeholder - awareness of the KBA and species.		0.02					0.02		0.02		**0.06**
		Review of the management plan					0.03					0.03	**0.06**
Total			**0.07**	**0.17**	**0.27**	**0.07**	**0.05**	**0.02**	**0.02**	**0.02**	**0.02**	**0.03**	**0.74**

CHAPTER 4: MONITORING AND EVALUATION

4.1 Monitoring and Evaluation Mechanism

For the successful implementation of planned activities, periodic monitoring is necessary. The Divisional Forest Office, Samtse shall initiate and conduct timely monitoring during the implementation of activities and provide updates to Nature Conservation Division for further review and recommendation on any challenges. The data, reports, and information on the KBA shall be maintained and made available by the Nature Conservation Section under the management of Divisional Forest Office. Similarly, Samtse Range office shall actively engage in the implementation of the activity to keep track of the progress.

4.2 Financial and Timeline

The KBA conservation action plan for *Bazzania bhutanica* and other significant species has been developed for 10 years from 1st July 2023 to 30th June 2033. An action plan has been developed to overcome the threats in KBA through the implementation of a series of conservation activities. The budget estimated to execute the planned activities is Nu. 0.74 million (Ngultrum Seven Lakhs Forty Thousand) only.

Table 2: Monitoring Framework

Objective	Action	Output indicator	Baseline	Unit	Yearly Target										Total
					Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	
Protection and conservation of species and their habitat	Plantation of associated shade bearing tree species	Plantation created	0	Ac		1									**1**
	Install physical barrier (bio-fence) to deter human & other wildlife trespassing to the critical habitats	Physical barrier conducted	0	Meter		400									**400**
	Procure high magnifying hand lens and other accessory equipment.	Equipment procured	0	Nos	20										**20**
	In situ conservation of species through development of trial plots /demonstration	Trial plots established	0	Nos	2										**2**
	Plantation maintenance & Demonstration plots	Maintenance conducted	0	Nos			1	1	1	1					**4**
	Fencing with barbed wires for in situ conservation demonstration plots	Fencing installed	0	Nos	2										**2**
	Group formation and preparation of by-laws with local communities on utilization of forest products	Group formed	0	Nos	1										**1**
	Installation of waste bins	Waste bins installed	0	Nos				3							**3**
	Installation of Signages	Signage installed/maintained	0	Nos	2							2			**4**
	Community/stakeholder - awareness of the KBA and species.	Awareness program conducted	0	Nos		1					1		1		**3**
	Review of the management plan	Evaluation conducted	0	Nos					1					1	**2**

References

DoPFS. (2021). *Forest and Nature Conservation Code of Best Management Practices of Bhutan Vol V: Cross Cutting Regimes*.

Kitagawa, N., & Grolle, R. (1986). A New Acromastigum-like species of Bazzania S. Gray From Bhutan. *Hattori Botanical Laboratory*, *61*(Dec), 269–272.

Long, D. G., & Grolle, R. (1990). Hepaticae of Bhutan 11. *Hattori Botanical Laboratory*, *68*, 381–440.

Long, D. G., Gurung, B. R., & Pradhan, R. (2009). *The rediscovery and conservation status of Bazzania bhutanica in Bhutan*.

Meagher, D. (2006). Bazzania scalaris sp. nov. (Marchantiophyta: Lepidoziaceae) from Papua New Guinea. *Telopea*, *11*(3), 246–251.

Singh, D. S., & Singh, D. K. (2014). *Bazzania bhutanica* (Lepidoziaceae, Marchantiophyta) - A critically endangered liverwort recorded in Indian bryoflora. *Lindbergia*, *37*, 42–46. https://doi.org/10.25227/linbg.01049

DIVISIONAL FOREST OFFICE, SAMTSE

Department of Forests and Park Services
Ministry of Energy and Natural Resources
Samtse, Bhutan