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Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Thimphu: Bhutan

Forest Facts & Figures 2018

National Forest Information & GIS Section
Forest Resources Management Division
Department of Forest and Park Services
Ministry of Agriculture and Forests
Thimphu : Bhutan

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Cover Photo Arun Rai, Dy. CFO, FRMD

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FOREWORD

Making appropriate and timely decisions is of critical importance for managing forest resources and achieving the objectives of sustainable forest management. These important decisions require adequate, consistent and complete information to strengthen the decision making process and for introduction of new interventions. Department of Forest and Park Services had been putting lots of effort on making forestry information available at all times and published forestry facts and figures annually since 2011, which served as tools for making informed decisions. The forest statistics reported in facts and figures published in the past has been extensively used by our department as well as other stakeholders. The information on timber removals, forest lost to forest fires, plantation records had been critical for development of Forest Reference Emission Level and Forest Reference Level for Bhutan. Similar information such as forestry clearance issued for developmental activities were used as proxy indicator for assessment of drivers of deforestation and forest degradations. The information content in the past publications were further useful for formulating 12th Five Year Plan for the Department.

This publication is compiled from the Forestry Information Reporting and Monitoring System, wherein information is entered into the system on real time basis by our forestry colleagues from various part of the country. Therefore, this report provides the most recent and reliable information and data on forest resources, the services provided and the challenges faced by the Department. This publication also provides information on Human Resources of the Department and list of offices and contact address under Department for better coordination with stakeholders and enhance the public services.

We are optimistic that this booklet will prove useful to decision makers, researchers, academicians, conservationist, planners and many other stakeholders both within and outside the Department and encourage all readers to use the information.

We have achieved so much with the collective effort of all in the Department. Hence, I put on record my sincere appreciation to all the field colleagues for continuously striving to fulfill important goals and mandates of the Department. In addition, I must also congratulate Forest Resources Management Division (FRMD) for their tireless effort in collecting, cleansing, sorting, analyzing and consolidating into this information booklet.

Lobzang Dorji
Director

INTRODUCTION

Forest Facts and Figures 2018 is a compilation of information on the administrative functions, programs, sustainable forest management, resource utilization and challenges faced by the Department. The data are generated from the online database "Forest Information Reporting and Monitoring System" (FIRMS) and includes information on services provided by the Department in the 2018 calendar year. The data are punched by more than 200 data managers at the Beat, Range and Division level in all the field offices.

The data entered by the data managers at Beat and Range level are cleaned and verified by the data manager at the Division head office. The data are then cleansed by the National Forest Information & Geographic Information System (NFI & GIS) Section and analyzed for depiction in this statistical booklet.

The timber volume data generated and tabulated in the booklet are actual measured volume at the time of tree marking unlike in the past, where by the volume of timber was generated using default conversion factor for trees and timber types reported in numbers. As a result, the volume of timber reported in the past may have been overestimated or underestimated. The Department, noticing the importance of the actual volume allotted for sustainable forest management developed the FIRMS, whereby it is necessary or required to input the actual volume allotted and not the number of trees allotted.

KEY FACTS

Forest cover (FRMD 2016)		Protected Areas	
Area (ha)	2,730,889	Protected Area Network	19,750.57 Km^2
Percent	71%	Protected Area	42.70%
Basal area (5 % MoE)	114,791,541 m^2	Biological Corridors	8.60%
Total growing stock (6% MoE)	1,001 million m^3	Royal Botanical Park	0.10%
Total biomass (forest)	1,109 mt	National Parks	5 Nos
Total carbon (forest)	521 mt	Wildlife Sanctuaries	4 Nos
Soil organic carbon	188 mt	Strict Nature Reserve	1 No
Total forest carbon stock	709 mt	Biological Corridors	7 Nos
Forest type (FRMD 2016)		**Biodiversity**	**Recorded/ estimates**
Subtropical Forest	6%	Vascular plants	< 5,600
Fir Forest	9%	Ferns and their allies	411
Warm Broadleaved Forest	18%	Endemic plants	145

Blue Pine Forest	4%	Bryophytes	282
Chir Pine Forest	3%	Fungus	350
Cool Broadleaved Forest	26%	Insect-Fungi	< 100
Evergreen Oak Forest	1%	Lichen and Lichenicolous	287
Spruce Forest	1%	Rhododendron species	46
Hemlock Forest	2%	Orchids	469
Fir Forest	9%	Mammals	200
Juniper-Rhododendron Scrub	1%	Elephants	678
Institutions (Nos)		Tiger	103
Functional Divisions	5	Snow leopard	96
UWICER	1	Bird	740
Global Tiger Center	1	Globally threatened birds	47
Territorial Divisions	14	Amphibians	56
Protected Areas	10	Reptiles	102
Range Offices	73	Butterfly	586
Beat Offices	81	Moths	16
Forest Check Posts	41	Fishes	119
FMU Offices	21	Macro-invertebrate	488
Social Forestry			
Community Forest	781	NWFP groups	148
Households (Hh) involved in CF	32402	Hh involved in NWFP	5564
Community Forest Area (ha)	92164.551	Total number of wood-based industries	128

ORGANIZATIONAL STRUCTURE

The Department of Forests and Park Services (DoFPS) is one of the oldest Departments established in 1952, with its headquarters in Samtse. The Department is currently located in Thimphu and is headed by the Director. The Department is assisted by five Functional Divisions viz., the Forest Protection and Enforcement Division (FPED), Social Forestry and Extension Division (SFED), Forest Resources Management Division (FRMD), Nature Conservation Division (NCD) and Watershed Management Division (WMD) at the headquarters and two regional centers of Ugyen Wangchuck Institute of Conservation and Environmental Research (UWICER), Bumthang and the Global Tiger Centre (GTC), Gelephu. The functional divisions provide technical backstopping to the field offices in their respective programs of community and social forestry programs, sustainable forest management and utilization, wildlife conservation, watershed management and climate adaptation and resilience programs respectively. UWICER provides need based training and

conduct research in forestry while GTC carries out research on conservation of cats.

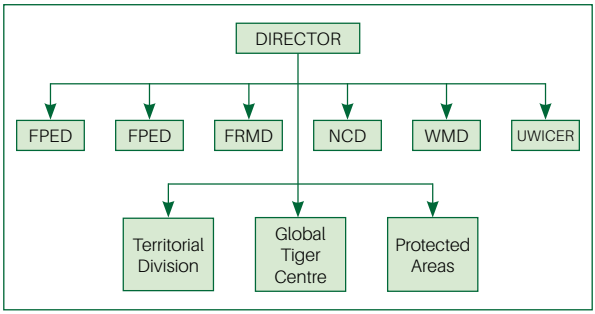

Figure 1: Organogram of the DoFPS

While the above mentioned offices formulates plans and programs for the Department, the field divisions; 14 Territorial Divisions and 10 Protected Areas (National parks, wildlife sanctuaries and strict reserves) implement the activities at the field level. Further, the Divisions and Park Offices implement their activities effectively through the Range and Beat offices (Table 1 and 2).

Table 1: Distribution of Gewogs in the Territorial Divisions

SL No.	Name of Division	Range	Gewog	Dzongkhag
1	Bumthang	Chamkhar	Choekhor & Tang	Bumthang
		Trongsa	Tashiling, Drakten, Langthel	Trongsa
		Chumey	Chumey	Bumthang
2	Dagana	Dangana	Tseza, part of Kana and Khebisa	Dagana
		Dagapela	Tsendagang, Gesterling, Goshi, Trashiding, Dorona & part of Kana,	
		Lhamoyzingkha	Lhamoyzingkha and Kamaling	
		Drujeygang	Drujeygang, Part of Khibisa, Laja, Tsangkha	
3	Gedu	Tsimasham	Bjabcho, Chapcha and Metakha	Gedu
		Gedu	Darla, Bongo, Gelling, Dungna and Getena	
		Phuentsholing	Sampheling, Phuntsholing & Logchina	
4	Mongar	Mongar	Mongar, Chaskhar, Thangrong, Narang, Balam , Chali & Tsakaling	Mongar
		Lhuentse	Menjey, Menbi, Tsenkhar & Gangzur	
		Gyelpozhing	Drepong, Jurmey, Kengkhar, Gongdue & Silambi	Mongar
5	Pemagatshel	Pemagatshel	Shumar, Nanong, Zobel & Khar	Pemagatshel
		Yurung	Chongshing, Chimung, Dungmaed & Yurung	
		Nganglam	Norbugang, Dechheling & Choekhorling	

6	Paro	Paro	Tsento, Lamgong, Dopshari, Hungrel, Lungyi, Shaba, Dogar , Doteng & parts of Wangchang	Paro
		Haa	Bjee, Samar, Sombaykha, Useu, Gakiling and Katsho	Haa
7	Samtse	Samtse Range	Phuntshopelri, Samtse and Tading	Samtse
		Dophuchen Range	Dumtoe, Denchukha and Dophuchen	
		Norbugang Range	Norbugang, Ugyentse, Youeseltse and Sangnagcholing	
		Tashicholing Range	Norgaygang, Tendruk, Pemaling, Tashichoeling and Namgaychoeling	
8	Sarpang	Sarpang	Chudzom, Shomphangkha, Gakiling & Singye	Sarpang
		Gelephu	Samtenling, Sershong, Chhuzangang,Gelephu and Jigmecholing	
		Lhamoyzingkha	Karmaling and Lhamoyzingkha	Dagana
9	Samdrup Jongkhar	Samdrup Jongkhar	Orong, Gomdar Dewathang & Wangphu	Samdrup Jongkhar
10	Thimphu	Thimphu Range	Chang & Kawang	Thimphu
		Khasadrapchu	Mewang & Gene	
11	Trashigang	Wamrong	Lumang, Thrimshing, Kangpara and Khaling	Trashigang
		Trashigang	Kanglung, Samkhar, Yangyer, Bartsham & Udzorong	
		Radhi	Radhi, Shongphu, Phongmey & Bidung	
		Yangtse	Yangtse, Khamdong & Toedtsho	Trashiyangtse

		Doksum	Ramjar, Jamkhar, Tongzhang & Yallang	Tsirang
12	Tsirang	Tsirang Range	Rangthangling, Kikorthang & Tsholingkhar	
13	Wangdue	Wangdue Range	Athang, Daga, Gase-Tshowom, Nahi, Gase-Tshogom, Nyesho, Kashi, Phangyul, Thedtsho, part of Bjena, and Rubesa,	Wangdue
		Punakha	Kabesa, Guma, Talo, Chubu, Toewang, Dzomi, Limbukha, Shengana	Punakha
		Lobesa	Baap and Toep	
		Nobding	Phobjikha, Gangtoe, Dangchu, Sephu, part of Bjena and Rubesa	Wangdue
14	Zhemgang	Zhemgang Range	Nangkor and Trong	Zhemgang
		Nimshong	Bardo and Shingkhar	
		Panbang	Bjoka, Goshing and Ngangla	

Table 2: Distribution of Gewogs in the Park, Wildlife Sanctuaries and Strict Nature Reserve

Sl. No.	Park	Range	Gewog	Dzongkhag
1	Bumdeling WS (BWS)	Khoma	Khoma	Lhuentse
		Serzhong	Sherimuhung	Mongar
		Dungzam	Bumdeling	Trashiyangtse
2	Jomotsangkha WS (JWS)	Samdrupcholing	Phutshothang, Pemathang, Martshala and Samrang	Samdrup Jongkhar
		Jomotsangkha	Langchenphu, Serthi and Lauri	Samdrup Jongkhar
3	Jigme Singye Wangchuck National Park (JSWNP)	Tingtibi	Parts of Trong & Jigmecholing	Zhemgang & Sarpang
		Nabji	Khorphu, Trongsa and part of Jigmecholing	Trongsa and Sarpang
		Langthel	Parts of Langthel and Tangsibji	Trongsa
		Taksha	Athang	Wangdue
4	Jigme Khesar Strict Nature Reserve (JKSNR)	Lolithang (Proposed)	Bjee	Haa
		Sombaykha (Proposed)	Sombaykha	
5	Jigme Dorji National Park (JDNP)	Soe	Yaktsa & Yuetoey	Paro
		Lingzhi	Lingzhi & Naro	Thimphu
		Ramina	Goenshari	Punakha
		Gasa	Khatoed & Khamaed	Gasa
		Lunana	Lunana	

		Laya	Laya	Gasa
6	Phrumsengla National Park (PNP)	Western Park Range, Ura	Ura, Parts of Chumey	Bumthang
		Central Park Range, Lingmethang	Tsamang and parts Saleng	Mongar
		Eastern Park Range, Phawan	Metsho, Jarrey	Lhuentse
7	Phibsoo WS (PWS)	Nichula		Dagana
		Phibsoo		Sarpang
8	Royal Manas National Park (RMNP)	Umling	Umling, Chuzangang	Sarpang
		Gomphu		Zhemgang
		Manas	Panbang	Zhemgang
9	Sakteng WS (SWS)	Sakteng	Sakteng	Trashigang
		Joenkhar	Sakteng	Trashigang
		Merak	Merak and Lauri (Samdrup Jongkhar)	Trashigang & Samdrup Jongkhar
10	Wangchuck Centennial National Park (WCNP)	Central Range	Choekor, Tang	Bumthang
		Western Range	Sephu, Kazhi, Dangchu, Nubi, Lunana	Wangdi, Trongsa
		Eastern Range	Gangzor, Kurtoe, Khoma	Lhuentse

FOREST

The forest in Bhutan is defined as "any land with tree spanning more than 0.5 ha with trees higher than 5 meter and a canopy cover of more than 10 percent" under the National Forest Policy (NFP) of Bhutan 2011 and Forest and Nature Conservation Rules and Regulations of Bhutan (FNCRR), 2017. These definitions has been used to generate the forest cover data in the first National Forest Inventory and the Land Use and Land Cover Map of Bhutan.

1. Forest Cover

Bhutan has a total of 71% forest cover (2,730,889 ha) out of the total geographical area (3,839,400 ha) of the country (FRMD 2016). Broadleaved forest consists of major portion of the forested area with around 65 % while conifer forest constitutes 35 % of forest area. The forest cover of Bhutan marginally increased from 70.46% in 2010 to 70.77% in 2016.

Table 3 Dzongkhag wise Forest cover

SN	Dzongkhag	Dzongkhag Area (ha)	Forest Area (ha)	Forest Cover (%)	MoE%	90% Confidence interval	
						Lower	Upper
1	Bumthang	269,091	144,842	54	13	47	60
2	Chukha	186,149	151,164	81	7	75	86
3	Dagana	170,608	141,861	83	7	77	88
4	Gasa	310,398	112,272	36	28	26	48
5	Haa	188,635	129,500	69	11	61	75
6	Lhuntse	283,091	213,792	76	12	66	83
7	Mongar	192,536	158,031	82	7	76	87
8	Paro	127,461	72,574	57	16	48	65
9	Pemagatshel	101,217	83,745	83	10	75	89
10	Punakha	109,878	79,316	72	14	62	80
11	Samdrup Jongkhar	185,882	133,622	72	9	65	77
12	Samtse	129,216	77,299	60	13	52	67
13	Sarpang	163,928	127,397	78	9	71	83
14	Thimphu	177,841	94,256	53	16	45	61
15	Trashigang	218,253	159,998	73	8	67	79
16	Trashiyangtse	143,496	99,860	70	14	60	78
17	Trongsa	179,607	142,571	79	10	72	85
18	Tsirang	63,163	48,857	77	13	68	85
19	Wangdue Phodrang	399,641	292,824	73	8	67	78
20	Zhamgang	239,308	198,036	83	6	78	87

Source: FRMD, 2016

Table 4: Forest cover by forest type

Forest type	Forest Area (ha)	Forest cover (%)	MoE (%)	90% confidence interval	
				Lower	Upper
Subtropical Forest	241,804	6	3	6	7
Warm Broad-leaved Forest	693,683	18	2	17	18
Chir Pine Forest	98,563	3	7	2	3
Cool Broad-leaved Forest	986,765	26	1	235	26
Evergreen Oak Forest	31,464	1	0	0.8	0.8
Blue Pine Forest	137,230	4	4	3	4
Spruce Forest	40,183	1	7	1	1.1
Hemlock Forest	88,327	2	6	2.2	2.4
Fir Forest	352,552	9	2	9	9.3
Juniper-Rhododendron Scrub	57,242	1	12	1.3	1.6
Dry Alpine Scrub	2,654	0	56	0	0.1

Source: FRMD, 2016

Table 3 and 4 above shows the distribution of forest cover by Dzongkhag and forest type respectively. The Cool Broad-leaved Forest and Dry Alpine Scrub occupies 986,765 ha and 2654 ha respectively and constitute the largest and the least forest cover. The detail characteristics and major species composition of the different forest type in Bhutan is shown in Table 5.

Table 5: Forest types in Bhutan

Sl. No	Forest Type	Characteristics	Characteristic species
1	Subtropical Forest	• Contain many tropical genera and species, forming dense jungle • Scattered Sal trees in Sarpang areas • Altitudinal range: 200-1000 m (-1200m)	*Acrocarpus fraxinifolius, Ailanthus grandis, Bombax ceiba, Crateva regiliosa, Dillenia pentagyna, Duanbanga grandiflora, Gmelina arborea, Leea asiatica, Musa, Pnadanus, Pterospermum acerifolium, Shorea robusta, Tetrameles nudiflora, Thunbergia*
2	Warm Broad-leaved Forest	• Type of Subtropical forest, but occurs at higher altitude with lower rainfall • Contains mixture of Evergreen and deciduous broad leaved species • Many of the tropical genera e.g. *Duabanga, Pterospermum and Tetrameles* are absent	*Alangium chinensis, Altingia excelsa,Bischofia javanica Callicarpa arborea, Castanopsis indica, Cordia oblique, Dendrocalamus hookeri Dichroa febrifuga, Engelhardia spicata, Evodia fraxinifolia, Macaranga pustulata, Maesa spp.,*

		• Altitudinal range: 1000-2000m (-2300m)	*Mussaenda roxburghii, Pouzolzia sanguinea, Rhaphidophora eximia, Schima wallichii, Wendlandia puberula*
3	Chir Pine Forest	• Low-altitude xerophytic forest occurring in the deeper dry valleys of Bhutan • Almost no other tree species occur in such forest other than Chirpine • Altitudinal range:900-1800 m (-2000m)	*Buddleja asiatica, B.bhutanica, Cycas pectinata, Cymbopogon flexuosus, Euphobia royleana, Ficus oligodon, Grewia sapida Indigofera dosua, Rhus paniculata, Ziziphus incurva*
4	Cool Broad-leaved Forest	• Found on moist exposed slopes • Mixed forest in which oaks are LESS COMMON and other trees, both deciduous and evergreen, e.g. *Lauraceae, Exbucklandia* etc. are more abundant together with dense shrubs, climbers and epiphytes • Altitudinal range:2000-2900m	*Acer campbelli, A.sterculiaceum,Betula alonoides,Brassiopsis alpine,Chirita lachensis, Corylopsis himalayana, Elatostema monandrum, E. obtusum, Exbucklandia populnea,Ilex fragilis, Lecanthus peduncularis, Lindera neesiana, L.pulcherrima, Persea clarkeana, Pilea bracteosa,Rosa moschata, Rubus lineatus, Schisandra grandiflora, Symplocus dryiphila*
5	Evergreen Oak Forest	• Characteristic feature of some parts of Central Bhutan (for e.g. Trongsa and hills above Mongar) • Composition varies according to altitude and rainfall • At lower levels, Castanopsis hystrix and C. *tribuloides* are often dominant, higher up *Quercus lamellosa* becomes commoner	*Acer campbellii, castanopsis hystrix, C. tribuloides, Elatostema hookerianum, E.sessile, Galeola lindleyana, Juglans regia, Pilea symmeria, Quercus lamellosa, Skimmia arborescens, Symplocos lucida*
		• With increasing dryness, more xerophytic Quercus species, e.g. *Q. lanata, Q. griffithii* and *Q. semecarpifolia* and *Pinus wallichiana* are seen. • Not much shrub layer, whilst shady humid floors are dominated by small herbs • Altitudinal range: (1800-)2000-2600m	

6	Blue Pine Forest	• Temperate equivalent of Chirpine forest and occupies the dry valleys of Bhutan • Bluepine dominant with Quercus species in some places. • Xerophytic shrubs occurs and herbs mostly appear during the monsoon season • Altitudinal range: 2100-3000(-3200)m	*Berberis asiatica, Berchemia edgeworthii, Cotoneaster griffithii, Elaeagnus parvifolia, Euonymus grandiflorus, Indigofera heterantha, Jasminum humile, Prinsepia utilis, Lyonia ovalifolia, Quercus griffithii, Q.semecarpifolia, Rhododendron arboreum, Rosa sericea, Spirea canescens, Zanthoxylum armatum*
7	Spruce Forest	• Spruce forest with Hemlock and Fir forests occupy the montane cloud-forest zone of Bhutan • Often mixed with each other but separate forests can frequently be recognized• Spruce are found at lower altitude than Hemlock and Fir • Altitudinal range: 2700-3100 (-3200)m	*Acer cappadocicum, A.pectinatum, Berberis praecipua,Enkianthus deflexus, Larix griffithiana,Lindera heterophylla, Osmanthus suavis,Picea brachytyla, P. spinulosa, Salix daltoniana,Salvia campanulata, Taxus baccata*
8	Hemlock Forest	• Appears at higher altitude than Spruce where *Tsuga dumosa* is dominant species mixed with Spruce and Fir • Shrubby and arborescent rhododendrons are frequent with dense growth of ferns, lichens and bryophytes • Altitudinal range: 2800-3100m	*Arundinaria griffithiana, Betula utilis, Buddleja colvilei, Daphne bholua, Gaultheria fragrantissima, Larix griffithiana, Litsea sericea, Maddenia himalaica, Magnolia globosa, Pnax pseudo-ginseng, Rhododendron falconeri, R.hodgson, R. keysii, Rubus calophyllus, R.pentagonus, Sorbus thibetica, Tsuga dumosa, Viburnum mullaha*
9	Fir Forest	• Occurs in the highest ridges of Bhutan below tree line, where huge tracts are covered by no other tree species than Fir (Abies densa) and some Hemlock and Birch in places. • Luxuriant undergrowth of Rhododendrons and other shrubs with many small herbs on mossy ground layer are found.	*Abies densa, Arundinaria maling, Betula utilis, Bryicarpum himalaicum, Daphne bholua, Juniperus pseudosabina, Maddenia himalaica, Primula denticulata, Prunus rufa, Rheum acuminatum, Rhododendron cinnabarinum, R. hodgsonii, Ribes tikare, Rubus fragarioides,*

		• As tree lines are approached, the fir become stunted and are mixed with Junipers and smaller Rhododendron species • Altitudinal range: 3300-3800m	*Skimmia laureola, Sorbus foliolosa, Viburnum nervosum*
10	Juniper-Rhododendron Scrub	• Moist scrub vegetation occurring above treeline throughout Northern and Central Bhutan • Consists of scattered shrubs of Junipers, Rhododendron and *Potentilla arbuscula* but with rich herb layer appearing during the monsoon • Damp grassy meadow commonly found in this zone • Altitudinal range: 3700-4200m	*Gaultheria trichophylla, Juniperus recurva, J.squamata, Morina nepalensis, Pedicularis megalantha, Phlomis tibetica, Potentilla arbuscula, Primula sikkimensis, Rhododendron lepidotum, Thalictrum chelidonii, Trollius pumilus*
11	Dry Alpine Scrub	• More xerophytic vegetation found • Higher altitude than Juniper-Rhododendron Scrub • Altitudinal range: 4000-4600m	*Aconitum orochryseum, Astragalus acaulis, Chesneya nubigena, Cremanthodium thomsonii, Ephedra gerardiana, Meconopsis calderiana, Rheum nobile, Rhododendron anthopogon, Salix lindleyana, Saussurea gossypiphora, S. obvallata, Saxifraga moorcroftiana, Tanacetum gossypium, Thermopsis barbata*
12	Not sure	• When the data collector is not sure or doesn't know, which category of Forest type to record the plot into, it may be recorded as: "Not Sure"	

Source: FRMD 2012; 2016

2. Total Biomass and Forest carbon stock

Bhutan's forest store 709 million tonnes (Table 6) of carbon in the form of biomass carbon and soil organic carbon (SOC). The biomass carbon constitutes 521 million tonnes of carbon while SOC constitute 188 million tonnes of carbon (FRMD 2018).

Table 6: Biomass and carbon stock estimates of forest with ± margin of error at 90% confidence level

Carbon pools	Carbon Pool Constituent	Biomass (tonnes per ha)	Carbon (tonnes per ha)	Total Biomass (million tonnes)	Total carbon (million tonnes)	Margin of Error (%)
Above Ground Biomass	Trees	241 ± 14	113.74	657.15	308.86	6
	Shrubs	1.61 ± 0.27	0.7567	4.72	2.22	16
	Herbs	0.71 ± 0.15	0.3337	2.07	0.97	21
	Sapling	26 ± 10	12.22	72.31	33.99	39
Below Ground Biomass	Tree Roots	112 ± 5	50.29	290.78	136.67	5
	Sapling roots	9 ± 3	4.29	25.19	11.84	30
Litter	Litter	13.25 ± 2	6.2275	39.03	18.34	16
Dead Organic Matter	Coarse woody Debris	6.44 ±3	3.0268	18.14	8.53	41
Soil Organic Carbon	Soil (0-30cm depth)		64.07 ± 4.17		187.85	8
Total Forest carbon stock					709.27	4

Source: FRMD 2018

The total forest carbon stock is the summation of carbon stock in all five carbon pools identified by IPCC 2006 greenhouse gas inventory guidelines. Data collected from the NFI was used to compute biomass and carbon in four pools (Above ground biomass, dead organic matter including litter and coarse woody debris and soil organic matter) while the below ground biomass (BGB) was computed using the root: shoot ratio equation developed by Mokany et al. (2006) to the AGB of trees and saplings (FRMD 2018).

SUSTAINABLE FOREST MANAGEMENT

The sustainable forest management is one of the core mandates of Department and the National Forest Policy 2011 requires Department to bring all forest under sustainable management planning and implementation of management plans. Currently, Bhutan's forests are managed under different management regimes of Protected Areas (PA) network, Community Forest (CF), Forest Management Units (FMU), Heritage Forest, Private Forest and forest outside FMUs. Figure 2 shows the area under PA network (PA and Biological Corridors), CF and FMUs.

Figure 2: Area under Sustainable Forest Management with approved management plans

1. Protected Area (PA)

The PA Network in Bhutan consists of the National Parks, Wildlife Sanctuaries, Strict Nature Reserve, Biological Corridors and the Royal Botanical Park. Encompassing about 51.44 % of the country area (Table 7 and Table 8), the PAs play a vital role in the conservation of globally endangered floral and faunal diversity besides conservation of endemic plants. The PA system in Bhutan is unique as we have people living in and playing an important part in our conservation efforts unlike in many other countries, where settlements in the PAs are displaced.

Table 7 Protected Areas in Bhutan

Total Protected Area & Biological Corridors	Area (Km^2)	Percentage (%)
Total Protected Area	16,396.43	42.71
Total Area Biological Corridors	3,307.14	8.61
Royal Botanical Park	47.00	0.12
Total PAs & BCs	19,703.57	51.44

Table 8 Total area under Protected Area network

Name of Protected areas	Year of Estd	Area (Km^2)	Dzongkhags
A. National Parks			
1. Wangchuck Centennial National Park	2008	4,914.00	Gasa, Wangdue, Bumthang, Trongsa & Lhuentse
2. Jigme Dorji National Park	1995	4,316.00	Punakha, Gasa, Thimphu & Paro
3. Jigme Singye Wangchuck National Park	1995	1,730.00	Trongsa, Wangdue, Sarpang, Tsirang & Zhemgang

4. Royal Manas National Park	1966	1,057.00	Sarpang & Zhemgang
5. Phrumsengla National Park	2000	905.05	Bumthang, Lhuentse, Mongar & Zhemgang
B. Wildlife Sanctuaries			
1. Bumdeling Wildlife Sanctuary	1998	1,520.61	Trashiyangtse, Lhuentse & Mongar
2. Sakteng Wildlife Sanctuary	2003	740.6	Trashigang & SamdrupJongkhar
3. Phibsoo Wildlife Sanctuary	1993	268.93	Sarpang & Dagana
4. Jomotsangkha Wildlife Sanctuary	1993	334.73	SamdrupJongkhar
C. Strict Nature Reserve			
1. Jigme Khesar Strict Nature Reserve	1993	609.51	Haa
Total Protected Areas		**16,396.43**	
1. Biological Corridors	2008	3,307.14	Haa, Paro, Thimphu, Punakha, Wangdue, Sarpang, Tsirang, Trongsa, Zhemgang, Bumthang, Mongar, Lhuentse, Trashigang & SamdrupJongkhar
E. Recreational Park			
1. Royal Botanical Park	2004	47.00	
Total		**19,750.57**	

2. Production Forest

DoFPS carried out a detailed forest resources assessment (FRA) in 2013 to identify potential area of forest to bring under production through sustainable management. FRA guides the Department in identifying the potential Forest Management Units (FMU) to meet the increasing demand for timber and other forest produces from public, in particular from the construction sector. Out of the total country area of 3,839,400 ha, only 892.68 thousand hectares (Table 9) has been identified as potential area for production (FRMD 2013). This includes areas, which are currently managed under PA, FMUs CF, Non-wood forest product (NWFP) groups and Watersheds. Currently, around 7.5 % of the total country area is managed under FMU and CFs, which constitute major commercial timber production area.

Table 9 Details of potential forest production area in different management area (slope ≤ 35%)

Category	Area (000 ha)	Percent to geographical area	Percent to total forest land
Potential Production Forest area of Bhutan	892.68	23.25	33.00
Potential Production Forest area outside Protected Area Network	432.52	11.27	15.99
Potential Production Forest area inside Protected Area Network	452.54	11.79	16.73
Potential Production Forest area outside Major Watersheds	679.62	17.7	25.12
Potential Production Forest area inside Major Watersheds	212.48	5.53	7.85
Potential Production Forest area outside Protected Area Network and Major Watersheds	333.04	8.67	12.31

Source: FRPA 2013

a. Forest Management Unit (FMU)

"Forest Management Unit" means an area of State Reserved Forest Land (SRFL) designated for scientific management of the forest. These are managed under the prescription of written management plans prepared in line with provisions under the "Forest Management Code of Bhutan" 2004.

There are 21 FMUs (Table 10) in Bhutan covering an area of 197,377 ha, which corresponds to around 5.03 % of the total geographical area. Khengzor FMU is the newest addition to the list of FMUs in Bhutan with total area of 4096.35 ha.

Table 10: Details of FMUs in Bhutan

Sl. #	Name of units	Division	Total FMU area (ha)	Annual Allowable Cut (AAC) in m^3			
				Commercial	Rural	Rural cum Comm. & other Users	Total
1	Dawathang	Bumthang	17,541.66	9,756.00	2,424.00	6.00	12,186.00
2	Rudongla		14,686.58	12,000.00	2,999.00	nil	14,999.00
3	Karshong		4,715.77	3,535.00	1,500.00	nil	5,035.00
4	Chendebji		7,852.98	4,700.00	2,000.00	nil	6,700.00
5	Metapchhu	Gedu	10,676.53	4,400.00	630.00	nil	5,030.00
6	Haa East	Paro	6,580.99	nil	500.00	nil	500.00
7	Lonchhu		12,567.01	5,000.00	700.00	1,000.00	6,700.00
8	Selela		9,157.00	8,886.00	3,000.00	nil	11,886.00

9	Paro-Zonglela	Paro	16,155.81	6,366.00	3,000.00	nil	9,366.00
10	Bitekha		7,260.10	3,600.00	900.00	nil	4,500.00
11	Korila	Mongar	13,137.00	1,100.00	2,700.00	nil	3,800.00
12	Lingmethang		10,490.00	8900.00	500.00	nil	9,400.00
13	Rongmanchu		6,401.00	2700	500.00	nil	3200.00
14	Chamgang-Helela	Thimphu	4,508.78	nil	1,800.00	nil	1,800.00
15	Gidakom		13,100.00	3,670.00	2,000.00	nil	5,670.00
16	Dongdechu	Trashigang	4,856.00	3,965.00	1,249.83	nil	5,214.83
17	Khaling Kharungla		7,265.40	1,697.00	1,009.00	nil	2,706.00
18	Khotokha	Wangdue	9,407.48	7,500.00	1,900.00	nil	9,400.00
19	Gogona		8,080.60	5,161.00	1,167.00	nil	6,328.00
20	Wangdigang	Zhemgang	8,759.00	nil	2,100.00	nil	2,100.00
21	Khengzore	Pema Gatshel	4096.35	3700	400	nil	4100.00
TOTAL			**197,377.79**	**91,036.00**	**34,078.83**	**1,006.00**	**126,120.83**

b. Local Forest Management Plan (LFMP)

Local Forest Management Plans are prepared for areas outside FMU and other management regimes to manage the timber and other forest resources on sustainable basis. This is in line with the provisions of the NFP 2011 and FNCRR 2017 to bring all SRFL under sustainable management with management plans. There are currently 33 valid LFMP covering an area of around 129,696 ha including 11 new LFMP developed in 2018 (Table 11).

Table 11: LFMP established in 2018

Sl. No	Geog	Dzongkhag	AAC (m^3/yr)	Area covered by Plan (Ha)	Gross area (Ha)
1	Phobji	Wangdue Phodrang	8247	3250	15125
2	Samkhar	Trashigang	3140	5206	9052
3	Bardo	Zhemgang	17737	11793	20970
4	Tang	Bumthang	5205	10008	52003
5	Chumey	Bumthang	15357	5228	40241
6	Tsento	Paro	843	1952	36264
7	Lamgong	Paro	1073	1309	4937
8	Phuntenchu	Tsirang	2569	2155	13647
9	Goshing	Zhemgang	3210	2179	9911
10	Doteng	Paro	973	3240	19626
11	Ura	Bumthang	4237	5187	26567

3. Community Forest (CF)

Community Forest program in Bhutan is a major shift from the conventional forest management in Bhutan. This is a part of participatory forestry program, where local people are involved in forest management and decision-making process. The first community forest in Bhutan was established in 1997 at Dozam under Drametse Geog, Mongar Dzongkhag. The number of CFs has grown significantly over two decades (Figure 3)

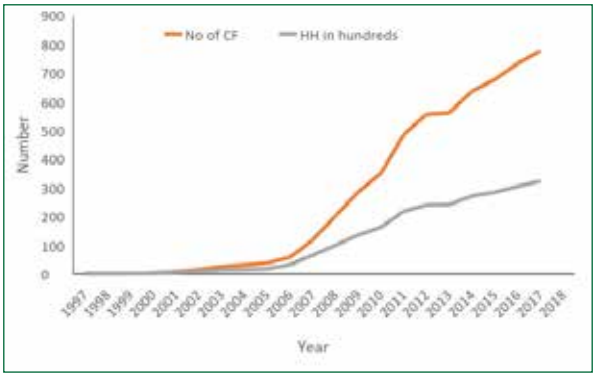

Figure 3: Trend of CF over two decades

As of December 2018, there are 777 CFs covering a total area of 90,318.77 ha. 34 CFs including both new and revised plan was established in the year 2018 (Table 12).

Table 12. CF established in 2018

Sl no	Name of CF	Gewog	Dzongkhag
1	Dhoza Tashigang	Getana	Chukha
2	Dophuchen	Phuntsholing	Chukha
3	Bamdir Chiwog	Metsho	Lhuentse
4	Karchung	Jarey	Lhuentse
5	Mangmaphu	Khoma	Lhuentse
6	Rewabee	Menbi	Lhuentse
7	Umbra Khoma	Khoma	Lhuentse
8	Youzha Marchungchung	Khoma	Lhuntse
9	Drepong Chewog Dungkhar	Drepung	Mongar
10	Ganglapong Kuenphen	Tsamang	Mongar
11	Lemdo	Tsentog	Paro
12	Tokha Zhisarp	Naja	Paro
13	Dungkar Gakiling	Decheling	Pemagatshel
14	Gonpung Gakid	Shumar	Pemagatshel
15	Khar Norbuling Chinor	Khar	Pemagatshel
16	Ngashing Phendey Gyalsay	Decheling	Pemagatshel
17	Puensum Phendey	Shumar	Pemagatshel
18	Tsangtseri Thundrel	Shumar	Pemagatshel
19	Woliktang Yerjay	Nanong	Pemagatshel
20	Norbuding	Guma	Punakha
21	Prakirtik Janakalyan Metothang	Pemathang	Samdrupjongkhar
22	Userna Miser Yargay Gongphel	Pemathang	Samdrupjongkhar
23	Chiloogsa	Samtse	Samtse
24	Lothuen	Gakidling	Sarpang
25	Zordung Samtenling	Kangpara	Trashigang

26	Gayphu Phuensum Tshogpa	Yangtse	Trashiyangtse
27	Yarphel	Yangtse	Trashiyangtse
28	Drongthang	Nubi	Trongsa
29	Chunyekhang Gongphel	Barshong	Tsirang
30	Tsakaling	Patsaling	Tsirang
31	Migtana Pindru	Athang	Wangdue Phodrang
32	Rephaka	Kazhi	Wangdue Phodrang
33	Shayueb	Athang	Wangdue Phodrang
34	Tabchaykha Draktsen	Gase Tshowom	Wangdue Phodrang

4. Non-wood Forest Product (NWFP) Group

Any area of State Reserved Forests harboring potential non-wood plants species suitable for management and marketing may be brought under management by NWFP Management Group. This along with the CFMG helps in improving livelihood of the rural people through the sale of forest products. There are 138 NWFP management groups in the country working with different NWFP species. Figure 4 shows the list of NWFP management groups established in 2018

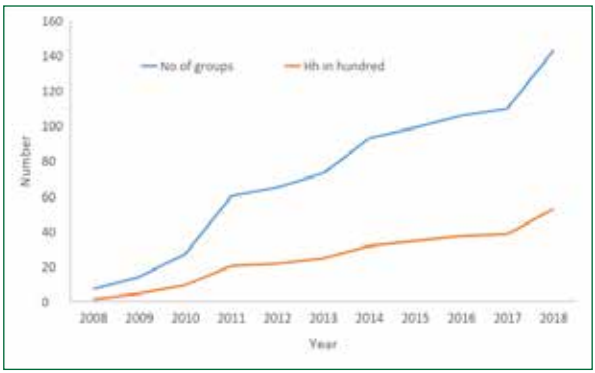

Figure 4: Details of NWFP group from 2008-2018

In 2018, a total of 19 NWFP groups were established with 981 households (Table 12).

Table 12: NWFP group established in 2018

Sl. no.	Dzongkhag	Geog	Name of NWFP Group	Member Households	Species
1	Chhukha	Metekha	Metekha NWFP Management Group	9	Plectocomia himalayana
2	Lhuntse	Metsho	Oongar NWFP Management and Marketing Group	33	Paris polyphylla, Borinda grossa, Mushroom
3	Mongar	Drametse	Yengkharseng NWFP Management and Marketing Group	15	Paris polyphylla, Daphne spp., Rubia cordifolia
4	Pemagatshel	Decheling	Ngangrey NWFP Zhingchong Tshogpa	31	Rubia cordifolia, Pouzoulzia, Thysanolaena spp.
5	Pemagatshel	Nanong	Raling Shingmen Detshen	26	Rubia cordifolia, Pouzoulzia
6	Samdrup Jongkhar	Gomdar	Rongchanglu NWFPs Group	17	Elatostema spp, Fern, Rubia cordifolia,Paris polyphylla,Pouzolzia spp, Mushroom,Daphne spp, Viscum album
7	Thimphu	Dagala	Jhom Daga Ngomen Tshogpa	38	Neopicrorhiza scrophulariiflora
8	Trashi Yangtse	Bumdeling	Longkhar NWFP Management Group	13	Bamboo
9	Trashi Yangtse	Bumdeling	Cheng NWFP Management Group	14	Bamboo
10	Trongsa	Nubi	Chella Zanthoxylum Management group	17	Zenthozyllum

11	Trongsa	Nubi	Jungthang Zanthoxylum Management group	30	Zenthozyllum
12	Wangdue	Phobjikha	Eusa NWFP Management Group	60	Paris polyphylla
13	Wangdue	Dangchu	Dangchu NWFP Management Group	218	Paris polyphylla, Borinda grossa, Mushroom
14	Wangdue	Kazhi	Beyulangdra Non-Wood Forest Product Group	56	Paris polyphylla, Balu, Sulu
15	Wangdue	Phangyul	Phangyul-Kumchi-Goenkha NWFP group	64	Phyllanthus emblica, Asparagus filicinus, Terminalia bellirica
16	Wangdue	Sephu	Ngomen Meto Pema NWFP Group	183	Paris polyphylla, Borinda grossa, Mushroom
17	Wangdue	Tsedtsho	Lamjithang NWFP Management Group	80	Mushroom
18	Zhemgang	Ngala	Marangduth NWFP Management & Marketing Group	25	Neomicrocalamus andropogonifolius , Diplazium esculentum, Knema laurina, Borinda grossa, Piper betle, Oroxylum indicum, Thysanolaena latifolia
19	Zhemgang	Goshing	Lamtang NWFP Management & Marketing Group	52	Neomicrocalamus andropogonifolius , Diplazium esculentum, Bambusa nutans, Knema laurina, Borinda grossa, Piper betle, Oroxylum indicum, Thysanolaena latifolia, Cinnamomum tamala

5. Watershed Management Plan

Watershed Management Plans are prepared "to ensure effective and integrated watershed management to maintain and improve water & watershed conditions and contribute to sustainable livelihoods through provision of watershed services." (WMD 2011). In line with this, the first watershed management plan (Baychhu in the Punatshangchhu basin) was prepared in 2013. There are currently 8 Watershed management plan prepared in the Wangchhu, Punatsangchhu, Chamkharchhu, Mangdechhu and Kurichhu basin. Further, assessment of Drangmechhu and Amochhu basin are under progress for management planning (Figure 5).

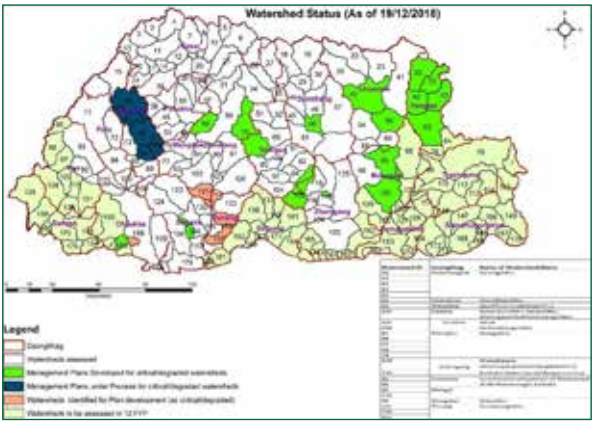

Figure 5: Status of Watershed assessed and management Plan

6. Plantation

All plantation works are carried out by the Green Bhutan Corporation Limited (CBCL) since it was formally launched in 2017 by the then Hon'ble Minister, Ministry of Agriculture and Forests. However, Department carries out annual maintenance of the existing plantations. Further, technical sanctions for plantation are issued by the Department. Table 13 shows the details of the technical sanction approved by the Department for plantations in different field offices for plantation maintenance. As per the records maintained by the Social Forestry and Extension Division, the area of plantation carried out in 2018 is 594 ha.

Table 13: Plantation in 2018

Sl. No	Name of Division	Total area (ha)
1	Bumthang	77
2	Dagana	85
3	Gedu	18
4	Thimphu	51
5	Samtse	15
6	Sarpang	1
7	Tsirang	90
8	Mongar	23
9	Paro	24
10	Trashigang	19
11	Wangdue	61
12	SWS	23
13	JSWNP	22
14	JWS	62
15	JDNP	25
	Total	594

Further, the department propose to carry out and/or coordinate plantation in around 2000 hectares in the 12th FYP.

RESOURCES UTILIZATION

The Department provides timber, sand, stone and other forest resources to all citizens of the Kingdom for their bonafide use either departmentally or through the authorized agency of the Government.

1. Timber allotment

a. Timber allotment directly by the Department

The Department allotted around 72,296 m^3 of timber in standing volume and about 35,473 m^3 of firewood (Table 14) at subsidized rate.

Table 14: Timber allotted for the rural purpose

Division / Parks	Standing Volume (m^3)	Firewood (m^3)
Bumthang Division	11354	1199
BWS	1629	222
Dagana Division	1929	2980
Gedu Division	769	816
JDNP	2379	969
JSWNP	530	458
JWS	3726	191
Mongar Division	5504	4305
Paro Division	5754	749

Pemagatshel Division	1324	351
PNP	2210	3044
PWS	33	40
RMNP	550	139
Samdrup Jongkhar Division	609	0
Samtse Division	4311	6608
Sarpang Division	1428	1274
SWS	3349	1554
Thimphu Division	5526	3551
Trashigang Division	4780	3685
Tsirang Division	1586	0
Wangdue Division	9957	2001
WCNP	1694	1313
Zhemgang Division	1367	24

Further, about 15,208 m^3 of timber in standing volume and about 11,894 m^3 of firewood (Table 15) was allotted at commercial rate of royalty. This excludes the timber allotted by NRDCL from FMUs and other areas operated by their organization.

Table 15: Timber allotted at commercial royalty

Division/Park	Standing Volume (m^3)	Firewood (m^3)
Bumthang Division	3366	421
BWS	250	25
Dagana Division	130	184
Gedu Division	427	1747
JDNP	2033	1841
JSWNP	238	16
JWS	2	0
Mongar Division	532	938
Paro Division	2174	1452
Pemagatshel Division	67	94
PNP	1327	571
PWS	783	0
RMNP	19	0
Samtse Division	52	0
Sarpang Division	1301	523
Sjongkhar Division	2	332
SWS	630	532
Thimphu Division	73	790
Trashigang Division	611	45
Tsirang Division	21	0
Wangdue Division	867	1470
WCNP	20	0
Zhemgang Division	283	913
Grand Total	15208	11894

In addition, a total of 151 and 223 m^3 of Bakal were supplied at rural and commercial rate of royalty respectively.

b. Timber allotment through Natural Resources Development Corporation Limited (NRDCL)

A total of 119,739 m^3 of timber (Figure 5) has been extracted by the NRDCL in 2018 from FMUs and other areas allotted by the DoFPS as per the FNCRR 2017 and Timber Extraction and Distribution Modality 2017.

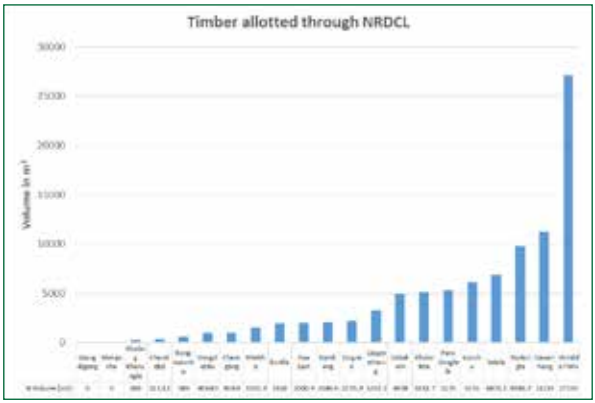

Figure 5: Timber allotment from FMUs and other areas

2. Non-wood Forest Product (NWFP)

Besides availing and utilizing the NWFP from the 138 NWFP groups in Bhutan, Bhutanese can also avail NWFP from the SRF both for local consumption as well as use in commercial use. Table 16 shows the list and quantity of different NWFP availed from the SRF during the calendar year 2018.

Table 16: Total NWFP supplied in 2018

Name of NWFP	Unit	Qty
Aconitum spp.	KG	150
Bamboo	Bundle	586
	Number	142,520
	Truckload	244
Banana Leave	Number	426
Stone and boulders	Truckload	401,185
Cane	Bundle	1,559
	Truckload	7
Charcoal	KG	1,000
Cinnamomum spp	KG	4,500
Daphne spp	KG	7,095
Elatostema spp	Bundle	26

Exidia recisa	KG	100
Fritillaria spp.	KG	425
Hippophae rhamnoides	KG	576
Leaf moulds	Truckload	1,298
Leaf needle	Truckload	1,387
Lemongrass oil	Litre	288
Mushroom	KG	5,975
	Number	7,390
Nardostachys jatamansi	KG	23,233
Neomicro Calamus andropogonifolus	Bundle	65
Ophiocordyceps sinensis	KG	277
Paris polyphylla	KG	572
Phyllanthus emblica	KG	200
Picrorhiza spp	KG	100
Piper longum	KG	110
Piper nigra	KG	3
Pouzolzia spp.	KG	8,187
Resin	KG	14,147
Rhododendron spp	KG	3,528
Rubia cordifolia	KG	18,910
Sand	Truckload	41,582
Saw dust	Truckload	15
shilajit	KG	11
Soil	KG	600
	Truckload	4,119
Swertia chirata	KG	133
Terminalia bellerica	KG	100
Thysanolaena latifolia	Number	378
Wildlings (Saplings)	Number	4,614
Zanthoxylum armatum	KG	225

Forestry clearance allotted for different purposes

In 2018, forest clearance was issued for allotment of a total of 2,030.75 ha of forest land for different purposes. Forest clearance issued was highest in JWS with 435 ha, which includes the renewal of 275.56 ha of SRF allotted to Bhutan Calcium and Carbide Limited (BCCL) (Figure 6). Minimum forestry clearance was issued in PWS followed by Bumthang and SWS.

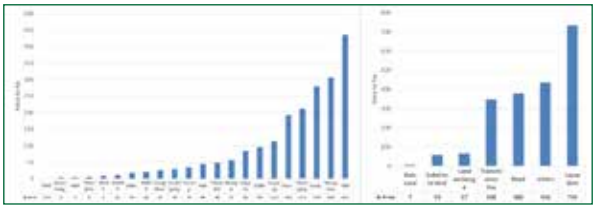

Fig. 6 Details of forestry clearance in 2018 by field offices (left) and purpose (right)

Increasing number of illegal activities

1,423 number of offences were detected in 2018 (Table 17). Illegal activities related to timber were the highest with 924 cases, while 40 poachers were apprehended.

Table 17: Details of different offence type

Offence type	No of cases	Reward (Nu.)	Fine (Nu.)	Compensation (Nu.)
Timber	924	2,960,249	114,156,590	135,189,601
NWFP	357	1,442,604	3,395,600	5,327,866
RHBT misuse	78	180,087	827,703	1,538,273
Land	44	188,810	773,970	9,732
Poaching	20	300,000	300,000	84,000

The timber related offences has the highest illegal cases detected with 924 cases of illegal timber extraction and 78 cases of misuse of rural timber.

Forest fire

2018 witnessed a total of 39 fire incidences with highest number detected in Wangdue Phodrang Dzongkhag. However, the extent of area burnt is highest in Mongar Dzongkhag (1,199 ha) (Figure 7). The number of incidences of forest fire has been increasing despite of various fire management and advocacy programs carried out by the Department.

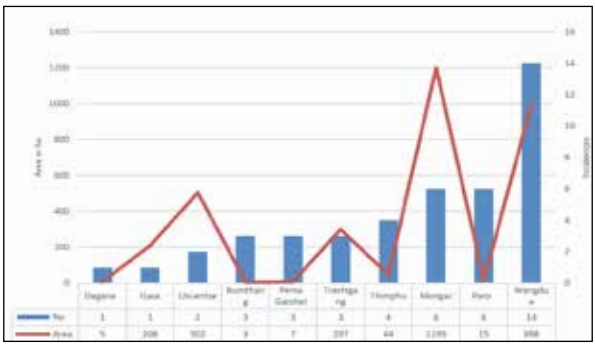

Figure 7: Details of forest fire in different Dzongkhags

Human Resources

The Department has 1,499 staff working in its functional division and field offices. This includes the technical forestry staff, other technical staff assisting in its integrated projects and non-technical staff (Administration and Finance) (Figure 8).

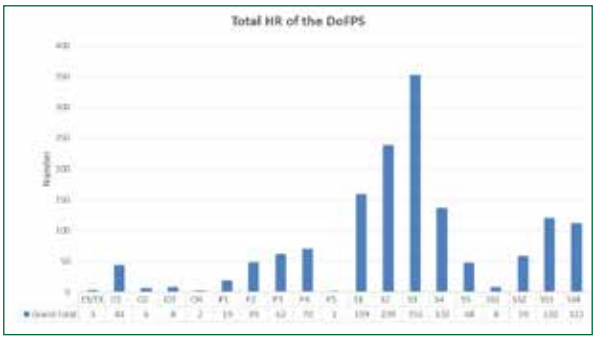

Figure 8: Total Human Resource of the Department

Apart from foresters, there are other technical staffs like veterinarian, agriculture officers, rangeland officers, meteorologist and environmentalist who support the Department in fulfilling its mandate of integrated forest management. However, there are only 1,392 technical foresters (Figure 9) with maximum staffs in the Ranger level. The low number of forestry staff as compared to the large working area and huge mandate of the Department is a huge challenge. Further, the number of foresters (Figure 10) who are one of the forefront managers in the field is low and with maximum number of female staffs. In contrary, the number of female is least at the officer level and none holding executive level position.

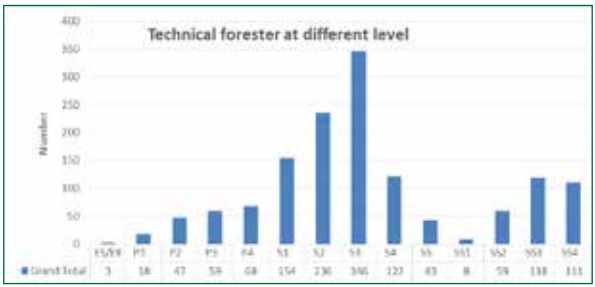

Figure 9: Technical forester at different position level

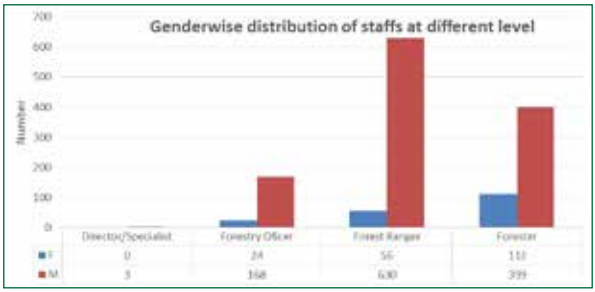

Figure 10: Gender wise distribution of staffs at different position level

Way Forward

1. Bhutan for Life Initiative

The Bhutan for Life (BFL) initiative was formally launched in November 11, 2017. It is an innovative funding mechanism for the PA network in Bhutan established by the Royal Government of Bhutan in partnership with the WWF. The initiative has sourced Nu. 43 million USD fund for the 14 years project period to help permanently protect and manage the PA network. The RGoB will gradually fill in the gaps through internal investment when project phases out

The Department has approximately Nu. 1,260 million for the 12th FYP under the BFL. This includes the fund secured through BFL and additional money to be secured through RGoB. This, with the different donor agencies and funding projects viz., Bhutan Trust Fund for Environmental Conservation, EU Technical Cooperation Project, GEF-LDCF, IUCN, PHPA, RDCAP, REDD+ and WWF shall help the Department to achieve its mandate of conservation and sustainable forest management.

2. National Forest Inventory

Realizing the importance of a periodic NFI, the Department proposed to conduct NFI once in every five years. The draft NFI implementation modality 2019 has already been deliberated and finalized. The NFI shall commence with the preparatory phase in the 2019-2020 FY and the commencement and completion of the actual field work in 2020-2022 FY. The NFI shall provide information on biomass, carbon, health, wildlife, species diversity and increment besides traditional forest parameters like height, basal area and volume. The 2nd NFI shall help to monitor the change in growing stock and increment over the years.

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