Participatory Forest Management Plan (PFMP)
Kaye Forest, Astore Forest Division

2022 - 2031

Gudai-Shekang Conservation Committee
&
Forest, Parks and Wildlife Department
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Disclaimer:
This Participatory Forest Management Plan is not a funding commitment from GB Forest, Parks and Wildlife Department. It is a proposal to be considered for future implementation of REDD+ Programme if funds are committed by the GB government. The success of this plan contingent to the commitment of all stakeholders involved in implementation of this plan.

وضاحت

جنگلات کے شراکتی انتظام کا یہ منصوبہ گلگت بلتستان کے جنگلات، جنگلی حیات اور ماحولیات کے محکمے کی جانب سے مالی وسائل کی فراہمی کا وعدہ نہیں بلکہ ایک مجوزہ لائحہ عمل ہے جس میں مستقبل میں ریڈ پلس پروگرام پر عمل درآمد کے لیے غور کیا جائے گا، اگر گلگت بلتستان کی حکومت مالی وسائل کی فراہمی کا انتظام کرتی ہے۔ منصوبے کی کامیابی اس منصوبے میں شامل تمام فریقین کے عزم پر منحصر ہے۔

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Acronym

AGB	Above Ground Carbon
BGB	Below Ground Carbon
ANR	Assisted Natural Regeneration
CKNP	Central Karakoram National Park
FD	Forest, Parks and Wildlife Department
FCPF	Forest Carbon Partnership Facility
GIS	Geographic Information System
GOP	Government of Pakistan
KKH	Karakoram Highway
LPG	Liquid Petroleum Gas
MW	Mega Watt
MoCC	Ministry of Climate Change
NCCP	National Climate Change Policy
NTFP	Non-Timber Forest Product
PFMP	Participatory Forest Management Plan
PFRA	Participatory Forest Resource Assessment
PSDP	Public Sector Development Programme
REDD+	Reducing Emissions form Deforestation and Forest Degradation
TFCC	Planning Commission Task Force on Climate Change
Ton/ha	Ton per hectare
WCSDO	Wildlife Conservation and Sustainable Development Organization
10 BTTP	10 Billion Tree Tsunami Programme

Executive Summary

Kaye Forest located in District Astore of Gilgit Baltistan is one of the three sites selected by the Forest, Parks and Wildlife Department (FD) in consultation with key stakeholders as a pilot site to demonstrate implementation of REDD+. This is part of a larger project being implemented by the Ministry of Climate Change, Government of Pakistan and the Provincial Forest departments in which a total of 15 Participatory Forest Management Plans are being developed for REDD+ implementation in all six entities of Pakistan.

The Government of Pakistan has joined global efforts to address deforestation and forest degradation to mitigate climate change and its impact by initiating REDD+ activities. REDD+ has three phases; i. readiness, ii. demonstration through implementation, and iii. result-based payments. The first two phases when combined are known as the REDD+ Readiness Phase. Pakistan has made substantial progress in meeting REDD+ readiness requirements. Pakistan has developed a National REDD+ Strategy in 2021. Whereas the Gilgit-Baltistan Forests, Parks and Wildlife department has developed a Subnational / Provincial REDD+ Action Plan. This action plan is a decentralised framework for GB to proceed with REDD+ implementation. Preparation of Participatory Forest Management Plans is an important step to implement this action plan by integrating and implementing REDD+ activities in forest management in various socio-ecological systems.

The local stakeholders were engaged in preparation of this Participatory Forest Management Plan. The plan will guide the implementation of REDD+ by projecting business as usual and reduced emission scenarios derived from detailed participatory assessment of socio-economic circumstances, ecological condition, and challenges (drivers), and assessment of the forest resource which have been described in this plan. The plan also presents stakeholders' analysis with their roles and obligations, use rights of forest dependent communities, conflict resolution and benefit-sharing mechanisms. This information is crucial for determining an inclusive set of activities and successful implementation of REDD+.

The analysis of forest cover revealed that since 2010 the Kaye Forest is increasing at the rate of 7.27 hectares per year, sequestering 2668 tonnes CO_2 eq annually. This increase is clearly a case of steady progress in forest cover, whereas most of the forests in rest of Gilgit-Baltistan are reportedly decreasing. The activities included in this PFMP if properly implemented, will further enhance this trend through collaborative forest management efforts of the stakeholders.

This plan has proposed distribution of carbon and non-carbon benefits accrued by the implementation of plan according to which 60% benefits will go to the Government, and 40% will go to the customary right holders and users. These benefits will only be distributed if the targets are achieved. The plan provides scenarios to reduce or increase benefits so that the stakeholders can enjoy results-based payment and benefits. The success of this plan, therefore, is contingent to the commitment of all the stakeholders involved. A specific and definitive distribution of benefits in case of REDD+ programme is yet to be developed by the government, which will form basis for sharing of benefits in the case of private forests. This proposed ratio will be finalized or confirmed only after finalizing GB's benefit sharing mechanism.

The initial period of this plan will be 10 years; however, the plan will be a living document and open for annual reviews. A budget forecast to implement activities mentioned is also provided in this plan. The major focus of the plan will be on enhancing forest cover by reforestation and regeneration of forest blanks and reducing the demand for fuel wood from the forest through promotion of energy efficiency and alternate sources of energy.

The implementation of activities described in the plan will be guided by annual operational plans to be developed by the provincial FD in consultation with the relevant stakeholders. The plan will be implemented by village and district committees to be notified by the provincial FD in consultation with the relevant stakeholders.

خلاصہ

گلگت بلتستان کے ضلع استور میں واقع کائے کا جنگل محکمۂ جنگلات، پارکس، جنگلی حیات اور ماحولیات کی جانب سے منتخب کردہ اُن تین مقامات میں سے ایک ہے جہاں ایک پائلٹ سائٹ کے طور پر اہم فریقین سے مشاورت کے ساتھ ریڈپلس کے نفاذ کا عملی مظاہرہ کیا جائے گا۔ یہ ایک بڑے منصوبے کا حصہ ہے جو وزارتِ موسمیاتی تبدیلی، حکومتِ پاکستان اور صوبائی محکمۂ جنگلات کے ذریعے لاگو کیا جا رہا ہے جس میں پاکستان کے تمام چھ علاقوں میں ریڈپلس پر عمل درآمد کی غرض سے مجموعی طور پر جنگلات کے شراکتی انتظام کے لیے پندرہ منصوبے بنائے جا رہے ہیں۔

حکومتِ پاکستان نے جنگلات کی کٹائی اور تنزلی سے نمٹنے اور موسمیاتی تبدیلی کے اثرات کم کرنے کے لیے ریڈپلس سرگرمیوں کا آغاز کر کے عالمی کوششوں میں شمولیت اختیار کی ہے۔ ریڈپلس کے تین مراحل ہیں۔ (i) تیاری (ii) عمل درآمد کے ذریعے مظاہرہ، اور (iii) نتائج پر مبنی ادائیگیاں۔ پہلے دو مراحل کو مشترکہ طور پر ریڈپلس کی تیاری کا مرحلہ کہا جاتا ہے۔ پاکستان نے ریڈپلس کی تیاری کی ضروریات کو پورا کرنے کے لیے خاطر خواہ پیش رفت کی ہے۔ پاکستان نے 2021ء میں ایک قومی ریڈپلس حکمتِ عملی تیار کی ہے۔ جب کہ گلگت بلتستان کے جنگلات، جنگلی حیات اور ماحولیات کے محکمے نے صوبائی سطح پر ایک جامع ریڈپلس ایکشن پلان تیار کیا ہے۔ گلگت بلتستان میں ریڈپلس پر عمل درآمد کو آگے بڑھانے کے لیے یہ ایکشن پلان ایک صوبائی فریم ورک ہے۔ مختلف سماجی ماحولیاتی نظاموں میں جنگل کے انتظام کے لیے ریڈپلس سرگرمیوں کو مربوط اور لاگو کر کے جنگلات کے شراکتی انتظام کے منصوبوں کی تیاری اس ایکشن پلان پر عمل درآمد کے لیے ایک اہم قدم ہے۔

مقامی فریقین نے جنگلات کے شراکتی انتظام کے منصوبے کی تیاری میں حصہ لیا۔ ریڈپلس پر عمل درآمد میں رہنمائی کے لیے اس منصوبے کے تحت دو مختلف منظرناموں یعنی موجودہ حالات اور اخراج میں کمی کا اندازہ لگایا جائے گا۔ اس مقصد کے لیے سماجی اقتصادی حالات کے تفصیلی شراکتی تجزیے، ماحولیاتی صورتِ حال اور چیلنجز اور منصوبے میں واضح کردہ جنگلاتی وسائل کا جائزہ لیا جائے گا۔ یہ منصوبہ فریقین کے کردار اور ذمے داریوں کے ساتھ اُن کے تجزیے، جنگلات پر انحصار کرنے والی لوگوں کے حقوق کے استعمال، تنازعات کے حل اور مشترک فوائد کے حصول کا طریقۂ کار بھی پیش کرتا ہے۔ ریڈپلس پر کامیاب عمل درآمد اور شراکتی سرگرمیوں کی تفصیلات کا تعین کرنے کے لیے یہ معلومات ضروری ہیں۔

جنگل کے رقبے کے تجزیے سے پتا چلتا ہے کہ 2010ء کے بعد سے کائے جنگل میں 7.27 ہیکٹر سالانہ کی شرح سے اضافہ ہو رہا ہے جس سے سالانہ 2,668 ٹن کاربن ڈائی آکسائڈ کا انجذاب عمل میں آ رہا ہے۔ یہ اضافہ واضح طور پر جنگلات کے رقبے میں مسلسل پیش رفت کا ایک کیس ہے جب کہ گلگت بلتستان کے باقی حصوں میں زیادہ تر جنگلات مبیّنہ طور پر کم ہو رہے ہیں اس PFMP میں شامل سرگرمیاں اگر مناسب طریقے سے لاگو ہوتی ہیں تو جنگلات کے مربوط انتظام کے لیے فریقین کی کوششیں اس رجحان کو مزید فروغ دیں گی۔

مجوزہ منصوبے کے مطابق اس منصوبے پر عمل درآمد سے حاصل ہونے والے کاربن اور نان کاربن محصولات میں سے 60 فی صد حکومت کو حاصل ہوں گے اور 40 فی صد جنگل کے حقوق رکھنے والوں اور صارفین کو ملیں گے۔ یہ فوائد صرف اہداف حاصل ہونے کی صورت میں تقسیم کیے جائیں گے اس لیے یہ منصوبہ فوائد میں کمی یا اضافے کا منظرنامہ پیش کرتا ہے تاکہ فریقین نتائج پر مبنی ادائیگی اور فوائد سے مستفید ہو سکیں۔ لہٰذا اس منصوبے کی کامیابی اس میں شامل تمام فریقین کے عزم پر منحصر ہے۔

حکومت کی طرف سے ریڈپلس پروگرام کے معاملے میں فوائد کی ایک مخصوص اور قطعی تقسیم فی الحال تیار نہیں ہوئی ہے جو جنگلات کے سلسلے میں فوائد کے اشتراک کی بنیاد بنائے گی۔ مشترک فوائد پر مبنی گلگت بلتستان کے طریقۂ کار کے طے ہونے کے بعد ہی اس مجوزہ تناسب کو حتمی شکل دی جائے گی یا اس کی تصدیق کی جائے گی۔ اس منصوبے کی ابتدائی مدت دس سال ہوگی تاہم یہ منصوبہ ایک زندہ دستاویز ہوگا اور سالانہ جائزے کے لیے پیش ہوگا۔

اس منصوبے میں مذکورہ سرگرمیوں پر عمل درآمد کے لیے رہنمائی متعلقہ فریقین کی مشاورت سے صوبائی محکمۂ جنگلات کی طرف سے تیار کیے جانے والے سالانہ آپریشنل منصوبوں کی مدد سے کی جائے گی۔ اس منصوبے کو گاؤں اور ضلعی کمیٹیوں کے ذریعے لاگو کیا جائے گا اور اس کے بارے میں متعلقہ فریقین کی مشاورت سے صوبائی محکمۂ جنگلات کے ذریعے مطلع کیا جائے گا۔

1. Introduction

1.1 The Context of PFMP

Pakistan has been implementing REDD+ activities since 2010 to mitigate climate change through reduced carbon emissions from the forestry sector. The Government of Pakistan (GoP), Ministry of Climate Change (MOCC) is implementing a REED+ readiness programme funded by the Forest Carbon Partnership Facility (FCPF) of the World Bank. This Participatory Forest Management Plan (PFMP) of Kaye Forest is to demonstrate integration and implementation of REDD+ activities in forest management in various socio-ecological systems. The plan will be jointly implemented by the respective communities and the Forest, Parks and Wildlife Department (FD) of Gilgit-Baltistan.

The PFMP translates REDD+ concepts and processes at practical level considering complex socio-economic conditions, burden of rights and concessions, as well as obligations in the forest. This is the reason that in addition to forest stock assessment, the preparation of PFMPs for REDD+ sites require a detailed assessment of the roles and rights of stakeholders in forest management and revenues so that trade-offs become clearer for redressal and communities are not deprived of their legitimate access to forest for their livelihoods. The core thrust of PFMPs in REDD+ perspective is to find contextually relevant options to address drivers of deforestation and forest degradation to mitigate global climate change. REDD+ also provides mechanisms for the enhancement, measurement, and trade of carbon.

This PFMP provides information including description of the site, GIS supported forest stock assessment, socio-economic situation, analysis of stakeholders with their interests and influences, emissions reduction scenarios, future interventions with estimated budget and implementation mechanism and key challenges for implementation. The activities that will maintain forest as carbon pool have been exclusively explained in this plan giving a lead and support role to stakeholders, as well as the expected outputs. It is expected that the implementation of the PFMP will enable the stakeholders of Kaye Forest to trade carbon credits in the national and international market in foreseeable future like any other product, by increasing and maintaining the carbon stock sequestered in the forest. The PFMP will thus act as a road map for implementation, monitoring, reporting and verification of resources improvement, and distribution of benefits among stakeholders.

A budget forecast to implement activities mentioned in PFMPs is also provided which is seemingly high. The reasons being high cost of hydropower (92% of the total cost of activities), as an alternative source of energy will not only benefit the Kaye Forest, but it also has a larger benefit and will serve communities in more than 20 other villages who depend on natural forests for fuelwood. These villages are situated in Nowgam, Gudai, Daskharim and Bubind sub-Valleys spread over around 30 km along the valley river. In addition, the Gudai and Shekang village have use rights in other forests which are roughly two times bigger than the site selected for this PFMP. Provision of electricity to villages in the valley for heating and cooking will benefit conservation of forests. The Gudai and Shekang villages being sole users of Kaye Forest will, however, have priority on the electricity generated from the proposed 2-megawatt power station. The villages in the valley currently share electricity generated from a 800KVA hydropower station installed on Bubind River near Gudai.

1.2 Objectives of PFMP

In line with the global and national objectives and priorities (see section 1.4), the following specific objectives for conducting the PFMP in Kaye Forest are as follows:

1. To enhance carbon stocks in the forest while addressing drivers of deforestation and forest degradation by involving forest stakeholders;

2. To introduce participatory forest management by engaging all the stakeholders in the forest management;
3. To shift focus of forest management from Protection to Carbon sequestration, ecosystem services, and bio-diversity conservation;
4. To build capacity of community activists and staff of FD for successful implementation of REDD+ in GB taking Kaye Forest as a pilot for learning.

1.3 Methodological Framework

The methodology used for development of this PFMP has been guided by PFMP Manual (version 1.0, 2021) for practitioners prepared under Forest Carbon Partnership Programme (FPCF) of the Ministry of Climate Change, (MOCC). Besides, tailored approaches suiting to the local conditions, but fitting well with the methodology were also included in the following major steps involved in preparation of the PFMP:

- Selection of site by the FD in light of the REDD+ guidelines and procedure.
- Consultation with local communities to ensure their consensus in participation and collaboration in REDD+.
- Engage local communities in data collection on socio-economic conditions, stakeholders' analysis, analysis of ecological conditions, and forest resource assessment.
- Conduct forest resource assessment (PFRA) through systematically identified sample plots and prepare forest and carbon stocks assessment and scenarios.
- Assessment of cover using Landsat multispectral spatial resolution satellite images and the Google Earth Engine Cloud Computing platform applying Random Forest Machine Learning Algorithm.
- Consultation with community to identify interventions to curb drivers of deforestation and forest degradation.
- Preparation of PFMP with a 10-year perspective including an annual operational plan to facilitate implementation.
- Approval and endorsement of participatory forest management by the GB FD and relevant community.

1.3.1 Collection and analysis of Socio-economic data

The socio-economic data was collected by a sociologist through Focused Group Discussion (FGDs), and Key Informant interviews (KII) with the communities. Initially FGDs were conducted in each of the two villages - Gudai and Shekang. The FGDs were followed by KII to enrich information collected in the FGDs. In the second round, a combined FGD was conducted where community members of both the villages participated. This step helped refining the data collected in the earlier meetings. KII were also conducted with the officials of the FD. In KII and FGDs, the roles and responsibilities of the stakeholders in forest management was discussed and defined.

1.3.2 Forest inventory and assessment of ecological conditions

Meetings were held with the officials of the FD especially the Chief Conservator of Forest (CCF), Conservator of Forest (CF) Divisional Forest Officer (DFO) Astore and REDD+ focal person to discuss the methodology and arrangements for forest inventory. Maps of the site were prepared, and 9 sample plots were marked on the maps.

A technical team consisting of a GIS specialist, two Range Forest Officers, two Forest Guards, three community representatives and two Helvetas consultants conducted forest inventory and collected

ecological data. A training session prior to forest inventory was held to train team members in forest inventory and to use equipment. The ecological survey and forest inventory was conducted in June 2021.

The team collected data from the sample sites as well as for the entire forest during inventory in the sample plots, a transact walk and discussions with the community and forest officials. The location of sample plots is provided in **Figure 2.**

At each observation points, sample plots were nested circular plots of 17.84 m, 5.64 m, and 0.56 m radius. All living trees and standing dead woods with DBH above 5cm, and stumps were measured from the full plot of 17.84 meters (~1000 m^2). The tree fallen, stumps, dead wood with diameter above 5cm falling in 17.84-meter plot were also recorded. In the subplots of 5.64 meters (~100 m^2) all seedlings were counted, and shrubs were harvested to measure fresh weight. The matter collected from samples was secured in individual bags and properly tagged. The weight of dry biomass was obtained after drying the matter in oven in the lab. In 0.56-meter plots (~1 m2) data on litter, leaves, and grasses was collected. The above-ground non-tree biomass including leaves, litter, grasses, etc. was collected from 0.56 m radius sub-plot and weighed. The soil organic carbon values are taken from the national forest inventory carried out in 2018. The time required for detection of a significant change in soil organic carbon is generally more than 10 years. The coordinates of each sample plot were recorded, and fixed-point photos were taken during the inventory. The field data and biomass collected from 9 samples was used to calculate Above Ground Biomass (AGB) using locally developed allometric equations (Ismail et al, 2018) for 2010-2021

1.3.3 Stakeholder Analysis

The stakeholder analysis was conducted using an interest influence matrix (**table 1**) to acquire information about major actors, and their interest and influence on forest resources utilization, management, or restoration. The information on stakeholder was conducted during FGDs and KIIs with the community FD officials. Stakeholders' analysis was essential understand roles of various actors in implementation of interventions identified in this plan.

1.4 Policy Alignment

The objectives of this local PFMP are aligned with the following provincial, national, and global policies/strategies/commitments related to REDD+.

1.4.1 Global Commitment:

"Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks (REDD+), is an essential part of the global efforts to mitigate climate change" (FAO, 2021). The REDD+ is a framework created by Conference of Parties (CoP) of UNFCCC to incentivise developing countries either to reduce emissions of Green House Gases (GHGs) or to increase sink of CO_2 in forest lands (UNFCC, 2021).

1.4.2 National Policies/commitments:

Pakistan is an active member of the international negotiation forum on climate change and making efforts to reduce emissions suiting to the priorities of its citizens (GCISC, 2018). The Government of Pakistan in its Nationally Determined Contribution (NDC) report of has indicated the county is commitment to reduce 15% of its projected emissions with national level resources by 2030. Pakistan has also committed to reduce additional 35% of emission through energy transition by 2030, if international grants finance US$ 101 billion to implement energy transition (GoP, 2021). The energy transition plan of Pakistan includes production of energy from renewable sources, ban on imported coal, and promotion of electric vehicles (ibid).

The National Climate Change Policy (NCCP) of 2012 under Section 4.4 on Forestry Sector states that the climate change is likely to have multi-faceted adverse effects on the ecosystem, particularly on the already vulnerable forestry sector in Pakistan. Mitigations in the forestry sector entail restoration of Pakistan's forests through sustainable forest management, with particular focus on how these are affected by climate change. This will not only benefit state forests but also the forests dependent communities and the whole society in general. The most likely impacts of climate change will be decreased productivity, changes in species composition, reduced forest area, unfavourable conditions for biodiversity, higher flood risks and the like, as portrayed in the Planning Commission Task Force on Climate Change (TFCC) Report (GoP, 2010). In the light of this realization, the Forest Policy of Pakistan 2015 provides legal basis to Federal Government in provisioning of support required to Provinces and other Territories in their efforts in combating deforestation, increase in forest cover, and meeting obligations (GoP, 2015).

1.4.3 Provincial Policies/commitments

The climate change policy of Gilgit-Baltistan acknowledges the role of forests in mitigation and adaption and most particularly to improve resilience of communities and their livelihoods in future scenarios of changes in local climate (GB-EPA 2017 p 28-33). The activities mentioned in this PFMP align well with the actions suggested in the climate change policy of Gilgit-Baltistan for managing forest and pastures.

2. Results - Participatory Forest Management Planning

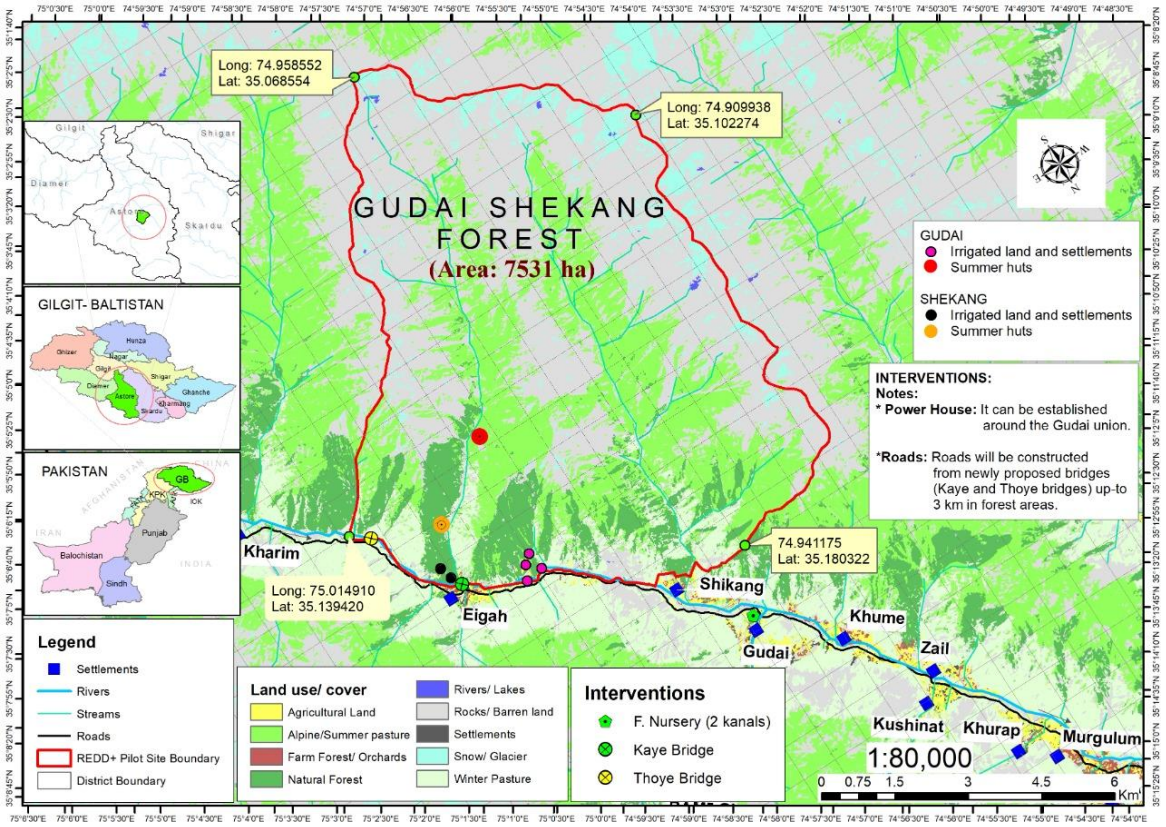
This section provides detail description of the components of the PFMP which includes; socio-economic conditions, ecological conditions, Stakeholders of the forest, and the drivers of deforestation and forest degradation.

2.1 Ecological description

2.1.1 Location and site description

The Kaye Forest is located in Union Council Gudai of District Astore (**Figure 1**) at an elevation range between 2,857 – 4,708 meters above sea level (asl). The total area of Kaye Forest selected for demonstration of REDD+ is about 7531 hectares. The Forest falls in the legal category of Government Protected Forest in which community have rights of fuelwood collection, grazing and Non-Timber Forest Products (NTFP). Timber is harvested with the permission of the FD. The site is located in a high-altitude region where the survival of local population in the harsh climatic conditions requires construction of homes with excessive use of timber and fuelwood for space heating. The unsuitability of concrete structures to local climate and in absence of alternative sources of fuel wood the community relies on the forest for timber, firewood. The major land use of the area is winters or summers pastures followed by forest land and snow cover / glaciers.

Figure 1. Land Use/Land Cover Map of Kaye Forest



2.1.2 Vegetation type

The forest has mixed and pure stands comprising major species of *Pinus wallichiana* (Kail)*, Picea smithiana* (spruce) and *Juniperus spp* (juniper). Besides, pure stands of *Betula utilis* (birch) can be found on ridges at higher altitudes and patches of *populus ciliata* (poplar) along the river at lower

altitudes. The forest of the valley is ideal habitat for Ibex, musk deer, snow leopard, fox, wolf, and a number of bird species.

2.1.3 Climate

Ecologically, the entire area falls in dry temperate region of the western Himalayan range which receives around 200 mm rains during the summers and 500 mm of snowfall during the winters. In winter temperatures in the valley can drop down to –25^{0}C mainly during December and January, whereas in summer temperature rise up to 30^{0}C during July and August.

2.2 Socio-economic conditions

2.2.1 Villages and people

Gudai-Shekang is connected to the District Headquarter Astore and District Diamer via all-weather road. It is also approachable from District Skardu via a seasonal road through the famous high-altitude plateau of Deosai which remains snowbound during winter. The Kaye Forest selected for REDD+ implementation is located in the north-east on the left bank of Gudai- Chilum Valley River. The village Shekang is situated along the North-west of the Kaye Forest along left bank of the Chilum Valley River and Village Gudai is situated across the river in the north. Presently, there are 250 households in Gudai, and 120 in Shekang with an overall population of 3000. The people of Gudai belong to three tribes Boonay, Loobay, and Khurmaye. The people of Shekang belong to three tribes, namely Botway, Satarkhany and Boonay. All tribes in the area speak Shina language which is a major language spoken in several areas of Gilgit-Baltistan.

Though the forest has remained under biotic pressure for long, but it is on faster rate of recovery since the time the excessive use was stopped mainly the supply of fuel and timer outside the valley for government and private uses. The analysis of satellite imageries of 2010 and 2021 coupled with the data collected in 2021 shows an increase in forest cover in the past 10 years. The local population believe that effective protection, conservative use, and ban to supply outside the valley contributed to the recovery of forest. However, there were no attempts were made to restocking of blank areas or to protect the natural regeneration. Regeneration however indicates favourable conditions for regeneration and growth. It was observed by the field survey teams that the regeneration in Kaye Forest is more profuse on higher elevation, and inaccessible area.

Those households who have agricultural land and settlements inside the forest have traditionally influenced forest management. These households have resisted cutting of forest close to their settlements. These households also play key role in regulating grazing on pastures adjacent to their agricultural lands. In recent years however these lands are not being cultivated as people have shifted to other sources of livelihoods, grazing and cutting of trees from area adjacent to their lands is not regulated by them.

2.2.2 Health and education

The literacy data is not available both for Gudai and Shekang, but local estimates indicate approximately 50% females and more than 60% for males are literate in Gudai. Whereas in Shekang 45% of females and more than 60% of males are considered to be literate. In Gudai there are two high schools (up to 10th grade), one for boys and the other for girls. Other government setup includes a C grade health facility, a police station, a tehsil office, a Range Forest Officers' office and a post office. In Shekang there are no such facilities apart from one middle school, but they can utilize the facilities in Gudai.

2.2.3 Sources of livelihoods and dependence on forest resource

The subsistence agro-pastoral system is the major source of livelihood in Gudai and Shekang. The main crop is potato. Wheat and vegetables are also grown. In summer livestock are taken to the high pastures. In autumn and spring livestock are free grazed in the forest area while in winter stall feeding is practices. The agricultural and livestock products mainly consumed locally but occasionally marketed for cash income.

The community has always remained heavily depended on the natural forest and pastures for their livelihood and wellbeing. The forest and pastures are the major sources for grazing livestock, and collection of NTFPs, timber and fuelwood. A study conducted in 2003 estimated per capita per annum local wood consumption in Gilgit Baltistan as 1.395 m^3 (Ministry of Environment, 2003; Khan et al., 2009) estimated per capita fuelwood consumption was approximately 12,079 kg (12.079 m^3) per annum for Bunji village located in District Astore. In absence of fuelwood consumption survey in Gudai-Shekang, the same figure can be used for all sites. The data on timber consumption in Gudai-Shekang valley or District Astor or Gilgit-Baltistan is not available. However, Ullah et al. (2021) found that each household in Basho valley use an average of 593 kilogram (0.593 m^3) of timber every month. Since Basho falls in the similar ecological zone, this data was used to assess the total quantity of timber used in Gudai-Shekang valley (**Table 3**).

Table 1. Per Annum Forest wood consumption in Gudai-Shekang

	Villages	Households	Population	Per annum wood consumption (cubic meters)		
				Fuel wood	Timber	Total
1	Gudai	250	2,027	3,019.75	879.00	3,898.75
2	Shekang	120	1,073	1,449.48	421.92	1,872.40
	Total	**370**	**3,000**	**4,669.23**	**1,300.92**	**5,970.15**

In the absence of economical and sustainable substitutes for fuelwood and timber, the population relies on natural forests for space heating and cooking. In the past the locals particularly youth migrated to major cities in Pakistan in search of jobs, for higher education, and health care. Most of the population of the area still dependent on farming and natural resources for their livelihood. The local population is also gradually switching to other sources of income including Government Jobs, businesses, and trade.

The use of Liquid Petroleum Gas (LPG) in addition to fuelwood for cooking and space heating is expensive affair which only few well-off families or those who were unable to collect wood. The LPG is expensive since it transported to Astore from Rawalpindi via Gilgit from where, local dealers transport to fuel stations in different valleys. The cost of transportation adds up and the prices of LPG become almost double when it reaches to the users in remote valleys. Therefore, LPG cannot be a sustainable and affordable alternative source of energy. Therefore, some individuals are compelled to harvest additional firewood to earn extra cash to purchase

The green pastures, forests, rivers, streams and lakes of Gudai-Shekang have always been a source of attraction for tourists. Tourism has drastically increased during the past 5 years and expected to generate opportunities for employment and businesses.

The river and streams in Gudai-Shekang contain trout fish which is a supplementary source of diet for local population. The local and tourists require permit for fishing in all water bodies in Gudai-Shekang valley. In the past two decades, the community has made substantial efforts to capitalize the

potentials of the area by investing in business opportunities including fish farming, and gardening which is likely to boost the local economy in near future. The mountains surrounding Gudai and Shekang have plenty of gemstones, which were occasionally and randomly extracted by outsiders, but in small quantity.

The Gudai-Shekang valley has great potential for hydro power generation. Presently the 800kva hydropower plant installed on Bubind River near village Gudai hardly caters for the basic needs of lightening of 15 villages including Gudai and Shekang. According to the local sources, the government has identified some more sites along Chillum and Bubind rivers where generation of more than 2-megawats electricity is possible (Figure 1). It is estimated that once hydro power plants in these locations are installed, sufficient electivity will be available for the entire valley and the dependency of people especially for fuelwood on forest resources will decrease substantially.

2.2.4 Stakeholders

The stakeholder analysis (**Table 1**) was conducted to acquire information about major actors, and their interest and influence on forest resources utilization, management, or restoration. The interest and influence explored through stakeholder analysis indicate who is doing what in managing forest and who has the legal rights in the forest. The stakeholders identified were categorized as primary and secondary based on the level of their participation and partnership in social, technical, financial, and legal aspects of forest management and REDD+.

The community and its institutions

The community of Gudai-Shekang is an important stakeholder with use rights in the Government Protected Forest. The community voluntary assistance to the FD in protection of forests in events of forest fire and to check illegal trade of forest products. Some community members have agricultural land inside the forest and therefore are important stakeholders in forest management as they have been regulating grazing and cutting of trees near their land. Two types of community institution exist in Gudai-Shekang.

Traditional Jirga: The separate Jirgas in Gudai and Shekang Villages consists of a number of *Motabars* (respected members of the community) and a *Member* (head of *Jirga*). The *member* and the *motabars* are selected with consensus. Each sub group/clan nominates 1 or 2 active members of their groups to represent them as *motabars* in the *jirga*. The *motabars* select a member to head the group called *member*. The *Jirga* makes decisions pertaining to all communal matters of the village. This includes conflict resolution. If the *jirga* is not able to resolve any conflict, the parties involved in the conflict

may seek support of religious leaders or take the case to the formal judicial system. It is important to note that seeking intervention of the *jirga* for conflict resolution is not mandatory. Most cases which involve conflict over communal resources however are resolved through the *jirga*.

Village Conservation Committee (VCC): The community has also formed a **VCC** to protect the forests. In Gudai the VCC was established in 1990s to protect the forest from large scale harvesting by the government to for uses outside the valley. The members of the VCC work voluntarily and are nominated with consensus. The VCC mainly controls illegal cutting and transportation of timber and firewood outside Gudai. The VCC assigned its members on rotation basis to guard the check post established by the VCC in the past, which is now managed by the FD. With support by the FD, the VCC also fines village households/individuals involved in violation of use rights including cutting of fresh trees. The VCC played a key role in the 1990s and early 2000s when the community agitated against extraction of legal and illegal wood from Kaye and forests, for use outside Gudai valley. The FD later banned all kind of wood transportation outside the boundary of Gudai. Due to its location at the exit point of the Gudai valley, the community of Gudai has played a more active role in safeguarding the forest.

Forest department

The FD is the custodian of the Government Protected Forest. The head office of the department is in Gilgit. Among other branches, the REDD+ Cell of the FD is based in Gilgit. The department has a Range Forest Officer (RFO) and several Forest Guards posted in Gudai to protect forests in the valley. The RFO reports to the DFO based in district headquarters Astore.

Ministry of Climate Change

The forest is a provincial subject and the provincial governments mange forests and make policies and rules as per the need of the provinces. The Federal Government represented by the Ministry of Climate Change (MoCC) provide vital guidance, experience sharing opportunities and international linkages to the provinces especially on REDD+. The Federal Government also signs international conventions related to environment. United Nations Framework Convention on Climate Change is an example. These obligations are then communicated to the provinces as actual actions on ground for fulfilling these obligations are taken in the provinces. The MoCC therefore is an important stakeholder in forest management in the provinces.

Other stakeholders

The Revenue Department (government agency tasked as custodian of land) and security agencies which intervene only if called by relevant authorities are other stakeholders. Protection of forest is however not their core area of responsibility; these actors fall in the category of marginal players in the matrixes.

Table 2. Participatory Stakeholder's Analysis Kaye Forest

STAKEHOLDER	INTEREST in Forest		INFLUENCE on Forest	
	Type of interest	Level of interest*	Type of influence	Level of influence*
FD	Sustainable management of forest resources and avoid forest degradation as legal representative of the Government	3	Legal controller: decision on use, protection, and improvement of forest resources Ban on timber extraction	3
Community Gudai and Shekang - households with no irrigated land inside the forest	Grazing, Timber Fuel wood, NTFP, Water	3	Local use and control of forest benefits; De facto control to stop any illegal harvesting of timber and grazing by outsiders in areas near their irrigated lands and settlements	2
Community Gudai and Shekang Households with irrigated land inside the forest	Grazing, Timber Fuel wood, NTFP, Water Protecting cropland, establishing tourist facilities on their properties	3	Local use and control of forest benefits; De facto control to stop any illegal harvesting of timber and grazing by outsiders Control on free grazing, securing cropland and adjoining forests	3
Village Conservation Committee and *Jirga Gudai and Jirga Shekang*	Protection of Forest, mainly extraction of timber	2	Maintaining timber extraction ban. Consensus building among communities for forest protection, advocacy for rights of the legal users, conflict resolution	3
Illegal harvesters (they have legal rights for domestic use but also harvest for sale)	Illegal harvesting of timber and firewood for cash income	2	Manipulation / illegal act	1
Provincial Revenue Department	None	0	Land monitoring and related dispute management	2
Provincial Law & Enforcement Agencies	None	0	Legal action on need basis	1
Federal Ministry of Climate Change	Sustainable management of forest resources and avoid forest degradation	2	Indirect influence through policies and (international) lobby	1

Note: 0 = no interest or influence, similarly, 1 = little interest, 2 = significant, and 3 = controller or vita

2.2.5 Stakeholders' analysis

The stakeholders and their roles identified were further analysed by using the influence-interest matrix to explore their type and level of influence and interest in forest management and carbon pools (**Table 2**). This matrix helps in understanding the actual influence and interests and may help identifying the need for increasing the involvement of specific stakeholders. It was found that the FD and local community with irrigated land inside the forest are the major players with greater interest in forest management. The major players in forest management are those having major interests and influence on using and protecting carbon pools. The stakeholders themselves may not be aware of this since the concepts are new. They may need awareness raising about this, especially of the importance and benefits of management of carbon pools.

The MoCC fall in the category of neglected players. It is because the MoCC has a high interest, but until now little influence on local forest management and carbon pools on ground. This may change in the future with increasing REDD+ initiatives supported on by the MoCC in the provinces which would also involves their role in distribution any income from sale of carbon.

The households with legal rights for grazing and collection of forest products but no irrigated land inside the forest and some of these who also harvest wood to sell for cash income fall under neglected players and need special attention to safeguard their interest.

The Revenue Department and law enforcement agencies also occasionally contribute to forest protection when called in events of disputes and forest offenses, but since the protection of forest is not their core area of responsibility they fall in the category of marginal players in the matrixes.

Table 3. Interest influence matrix of Forest Management and Carbon Pools

	Neglected players: Need special attention to safeguard their interests	**Major players:** Need to be fully involved
INTEREST **Hight** Score 2 and 3	MoCC Local community members who harvest for selling (Illegal harvesters)	FD Local community members with use rights and irrigated land and settlements inside the forest Local community with use rights and no irrigated land and settlements inside the forest *Jirga* Shekang and *Jirga* Gudai and Village Conservation Committee Gudai
	Marginal players Low priority	**Risk factors** Need to be addressed
INTERST **Low** Score 0 and 1	Law enforcement agencies Revenue Department	None
	INFLUENCE Low Score 0 and 1	**INFLUENCE High** Score 2 and 3

2.3 Analysis of drivers of deforestation, forest degradation and barriers to enhancement

Globally the anthropogenic activities that result in deforestation and forest degradation are accounted for 17–25% of annual GHG emissions causing global warming (Le Quéré et al., 2015). The Reductions in Emissions from Deforestation and Forest Degradation (REDD) is an international policy negotiated in 2005 under the United National Framework convention on Climate Change (UNFCC) to mitigate climate change and its impacts. The extension of REDD+ in REDD policies is to create financial benefits for forest owners for enhancement and storage of carbon in forest sinks by controlling drivers of deforestation and forest degradation. The analysis of the drivers of deforestation and forest degradation is therefore considered an essential component to understand the current trends and take essential steps to manage forest in ways that contribute towards climate change mitigation, and restoration of ecosystems services (Kissinger et al., 2012). FAO (2020) defines deforestation as, the conversion of forest to other land uses (regardless of whether it is human induced) which reduces forest cover. The "forest area net change" is the sum of all forest losses (deforestation), and all forest gains (forest expansion), and can be positive or negative, when gains exceed losses, or vice versa (ibid). The major driver of global deforestation is expansion of agricultural activities. The other drivers of deforestation include legal and illegal logging, forest fires, and urbanization including roads, infrastructure, hydroelectric dams (Francis and Nancy, 2019).

The results of forest cover assessed by using satellite imageries were shared in consultative meetings with elders of the community to generate discussion on historical trend of forest. It was revealed during the discussions that before the 1990s, Kaye and other adjacent forests were extensively harvested by the government for uses outside Gudai valley. The excessive use of forest resulted in severe deforestation and created blank areas in the forest. The local community agitated against this ruthless harvesting and finally established a check post to stop transportation of wood outside the valley. In 1990s, the Government of Gilgit-Baltistan stopped supply of fuelwood to government departments. The forest inventory conducted for this plan indicates that the efforts made by the FD and local community during the last 15 years to stop illegal extraction have resulted in increase in forest cover. Profuse natural regeneration in several places was noticed. In the light of the discussions and data gathered during preparation of PFMP, **the following drivers of deforestation and forest degradation** were identified in Kaye Forest:

Drivers of Deforestation: Large scale harvesting by the government in the past to supply timber and fuelwood for uses outside the valley

Drivers of Forest Degradation:

i. Extraction of timber and fuelwood for local uses. Heating during long winters need enormous quantities of fuelwood
ii. Small scale illegal harvesting of wood to sell for cash income in the absence of alternate sources of livelihood and income
iii. Grazing of animals resulting in damages to naturally regenerating areas

Barriers to forest restoration:

iv. Non-availability of alternate sources of energy especially for heating and cooking
v. Uncontrolled grazing Livestock grazing is a major barrier to forest restoration.
vi. Lack of recognition of community's role in forest management

The community have taken several effective measures to control drivers of deforestation and forest degradation. However, the community has not been rewarded or compensated for their efforts. Any Carbon trading in the future under REDD+ will encourage them to continue their efforts.

2.4 Carbon stock assessment in Kaye Forest

This chapter provides details description of the results of based on analysis of data based on data collected from sample plots in forest selected (Figure 2) in Kaye. The forest carbon stock is also provided in individual trees/ species level (Annex I), and in different strata (above, below ground and in soil) of plots. The quantity of carbon stock in the sample plot over the past 10 years (in absence of REDD+), and in the future 10 years in REDD+ scenario is also presented.

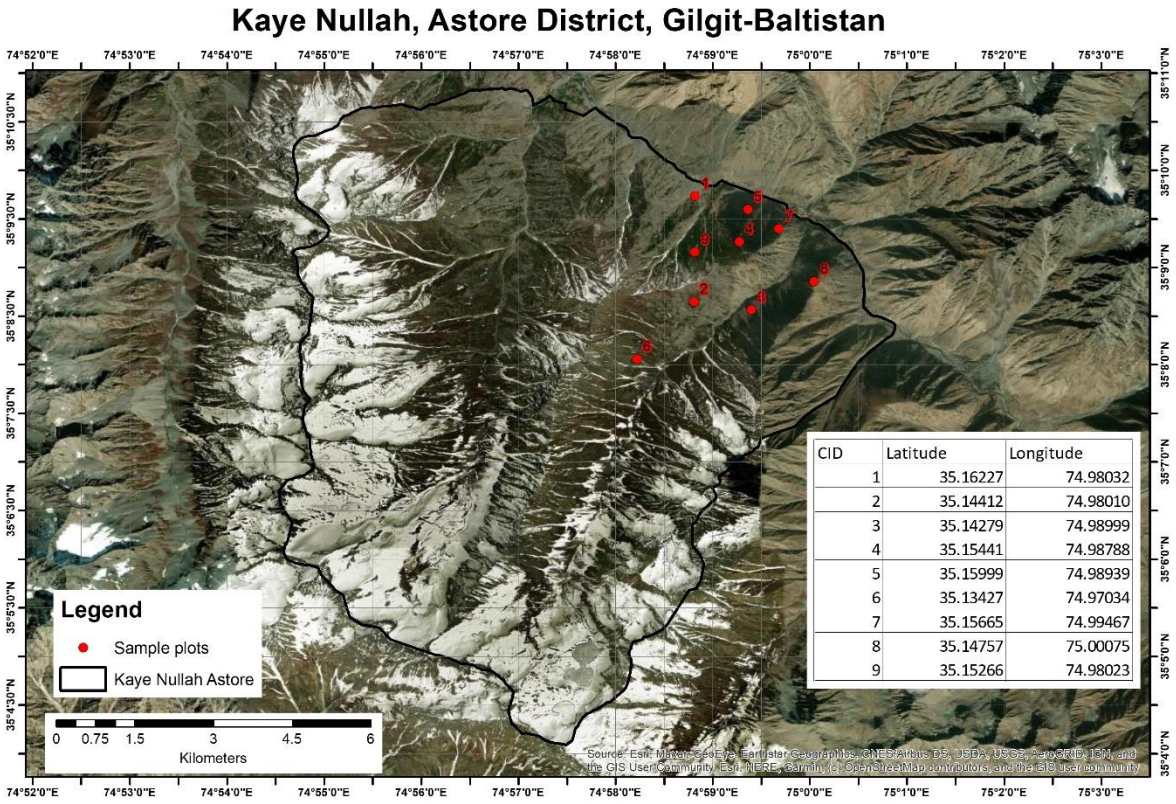


Figure 2. Location of sample plots

2.4.1 Plot level Carbon Stock Estimation

Based on the field data carbon stock (tons per hectares) for Above Ground Carbon (AGB) and Below Ground Carbon (BGB) was worked out using the standard sets for tree species, tree DBH and height, and dry biomass of shrubs and litter (**Table 5**). The carbon is trapped in 5 carbon pools (above ground biomass, below ground biomass, soil organic carbon, deadwood and litter on forest floor). Here, the five carbon pools have been grouped into three carbon pools (above ground, below ground and soil). The tree species level carbon stock is given in **Annex 1**. Based on this data individual plots level carbon stock values are given in **table 4**. The estimated stock of carbon per hectares (ha) was then used to estimate the total carbon stock in the selected site of Kaye Forest.

Table 4. Plot level above and below ground level carbon stock

Plot no	AGC[1] (ton/ha)	BGC (ton/ha)
1	40.92	10.23
2	11.97	2.99
3	23.32	5.83
4	7.89	1.97
5	40.32	10.08
6	33.75	8.44
7	21.84	5.46
8	28.75	7.19
9	16.66	4.17
Average	23.61	5.90

2.4.2 Forest Cover Assessment

The change in forest cover was assessed by using Landsat multispectral 30m spatial resolution satellite images on the path (149) and row (36) and google Earth Engine Cloud Computing platform for the classification of forest cover by applying Random Forest Machine Learning Algorithm. The analysis indicates an increase of 80 ha in forest cover in the past 11 years at an average rate of 7.27 hectare (ha) per year (**Table 5**).

Table 5. Changes in Forest Cover (2010-2021).

No	**Landsat Satellite Sensor**	**Landsat data acquisition**	**Forest Cover (ha)**
1	Landsat-8	2021-06-09	511
2	Landsat-5	2010-05-26	431
Increase in Forest Cover in last 11 years			80
Per year increase in forest cover			7.27

Table 6 provides **three scenarios** of forest cover in the coming ten years that may be followed:

1. Scenario 1: Just preserving and maintaining the current trend which is already moving in the positive direction at a rate of 7.27 ha of forest cover per annum
2. Scenario 2: Adding 10% more forest cover to the current positive trend.
3. Scenario 3: Adding 20% more forest cover to the current positive trend.
4. Scenario 4: Adding 50% more forest cover to the current positive trend

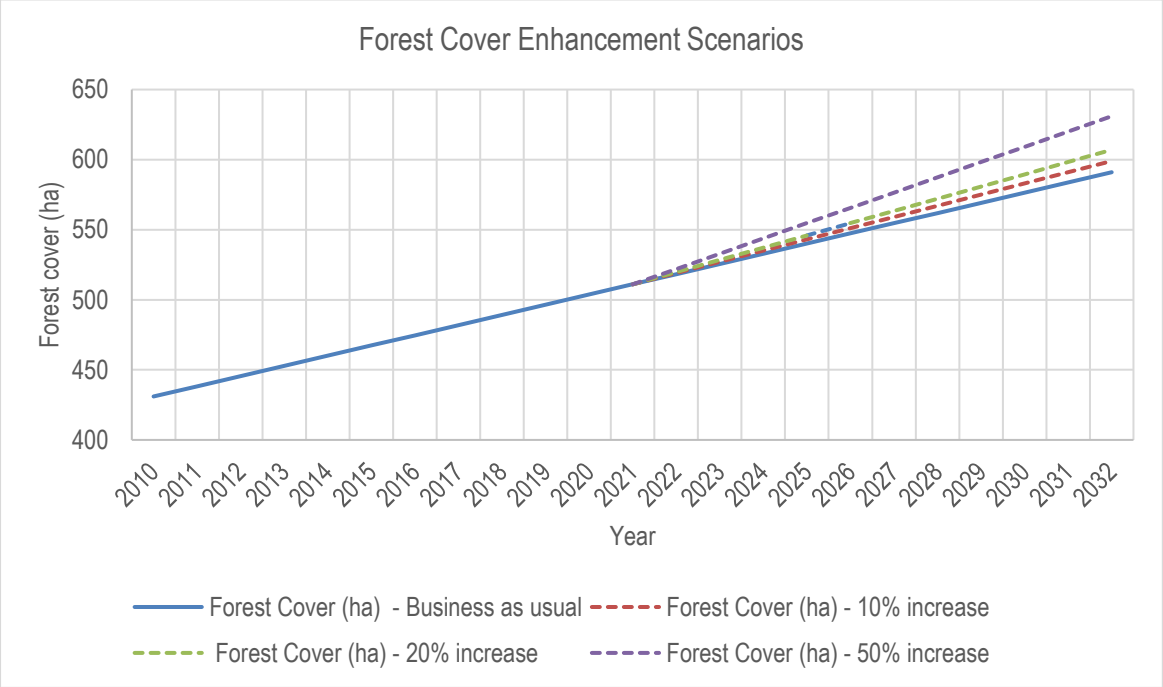
The different scenarios mean that the forest cover will continue increasing by 7.27 ha per year (as observed in the last 11 years) if the conditions remain the same in the same as in the past, however, for 10% enhancement of forest cover in addition to the current trend additional 0.7 ha of forest cover will have to be added annually whereas for 20 % enhancement 1.5 ha and for 50% enhancement 3.64 ha of forest cover would need to be added annually. Based on these scenarios carbon stocks are projected in the Table 8:

[1] Including deadwood and litter

Table 6. Forest cover Scenarios based on trends in the past 11 years

Rate of change per year	7.27	0.7	1.5	3.64
Year	**Forest Cover (ha) - Business as usual**	**Forest Cover (ha) - 10% increase**	**Forest Cover (ha) - 20% increase**	**Forest Cover (ha) - 50% increase**
2010	431			
2011	438			
2012	446			
2013	453			
2014	460			
2015	467			
2016	475			
2017	482			
2018	489			
2019	496			
2020	504			
2021	511	511	511	511
2022	518	519	520	522
2023	526	527	528	533
2024	533	535	537	544
2025	540	543	546	555
2026	547	551	555	566
2027	555	559	563	576
2028	562	567	572	587
2029	569	575	581	598
2030	576	583	590	609
2031	584	591	598	620
2032	591	599	607	631

These scenarios are presented visually in **Figure 3** (Forest cover Scenarios):



igure 3. Forest cover before and after REDD+ implementation

2.4.3 Total Carbon stock estimation and CO2 emissions

The field data and biomass collected from 9 samples was used to calculate Above Ground Biomass (AGB) using locally developed allometric equations (Ismail et al, 2018) for 2010-2021 (**Table 7**). In Kaye Forest, the cumulative carbon stock in five carbon pools (above ground, deadwood, litter, below ground and soil) was estimated to as 43,122 tonnes back in 2010 which increased to 51,126 tonnes in 2021. This change corresponds to the increase in forest cover from 431 ha in 2010 to 511 ha in year 2021 resulting in CO_2 sequestration at the rate of 2,668 tonnes of CO_2 eq per annum (see figure 4 and table 7).

Figure 4: Forest Cover Maps used for Change Analysis

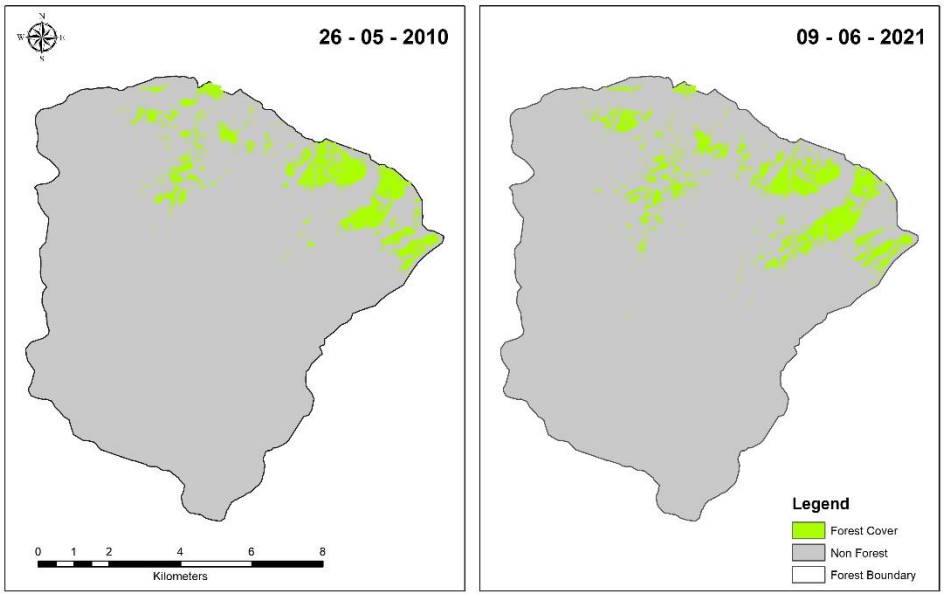


Table 7. Carbon stock estimation (2010-2021)

Carbon pool	Mean carbon stock (ton C per hectare)	Forest Area (ha)	Total stock (ton C)	CO_2 (ton CO_2 eq)
2010				
Above	23.60	431	10,172	
Below	5.90		2,543	
Deadwood	10.60		4,569	
Litter	0.60		259	
Soil*	59.35		25,580	
Cumulative			43,122	158,112
2021				
Above	23.60	511	12,060	
Below	5.90		3,015	
Deadwood	10.60		5,417	
Litter	0.6		307	
Soil	59.35		30,328	
Cumulative			51,126	187,460
Rate of change per year				
2021-2010		**7.27**	**727.64**	**2,668**

* Soil Carbon Value taken from NRO Inventory

2.4.4 CO2 Sequestration Scenarios from Forest cover Enhancement

This section presents the future CO_2 sequestration scenarios in case of REDD+ activity resulting in enhancement of forest cover by 10%, 20% and 50% in addition to business as usual trend (As per definition of forest adopted by Pakistan for REDD+).

Table 8. CO_2 Sequestration trend and Different Enhancement scenarios

Rate of change per year	2668	267	534	1334
Year	**Sequestration from forest enhancement (ton CO_2 eq) - Business as usual**	**Sequestration from forest enhancement (ton CO_2 eq) - REDD+ with 10% deduction**	**Sequestration from forest enhancement (ton CO_2 eq) - REDD+ with 20% deduction**	**Sequestration from forest enhancement (ton CO_2 eq) - REDD+ with 50% deduction**
2010	2668			
2011	2668			
2012	2668			
2013	2668			
2014	2668			
2015	2668			
2016	2668			
2017	2668			
2018	2668			
2019	2668			
2020	2668			
2021	2668			
2022	2668	2935	3202	4002
2023	2668	3202	3735	5336
2024	2668	3468	4269	6670
2025	2668	3735	4802	8004
2026	2668	4002	5336	9338
2027	2668	4269	5870	10672
2028	2668	4536	6403	12006
2029	2668	4802	6937	13340
2030	2668	5069	7470	14674
2031	2668	5336	8004	16008
2032	2668	5603	8538	17342

Table 8 shows that under REDD+ implementation if the current sequestration trend is supplemented at a rate of 10% then the forest will sequester annually additional 267 ton CO_2 eq, 534 ton CO_2 eq and 1334 ton CO_2 eq if the forest cover is enhanced by 10%, 20% and 50% respectively as shown in the figure 5 below.

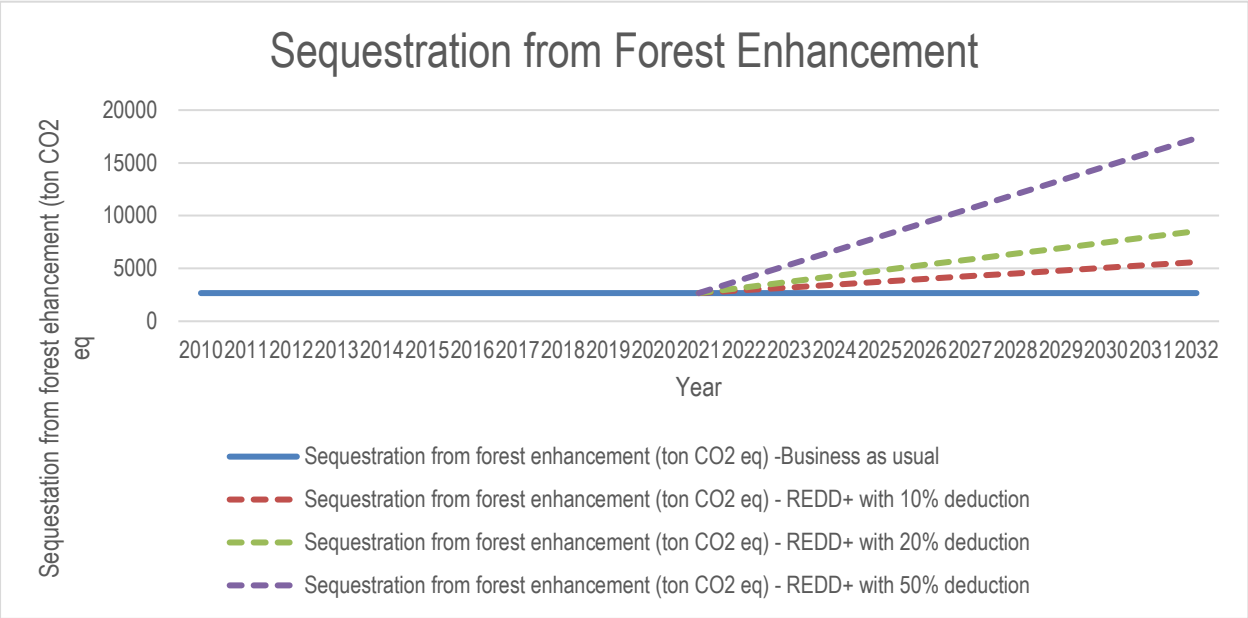


Figure 5. Sequestration scenarios – Forest Enhancement

2.4.5 CO2 Emissions Scenarios

Fuelwood and Timber consumption for the pilot site was estimated based on population of the area, population growth rate, per capita fuelwood consumption and per capita timber consumption data collected during the field survey. The total population of the pilot site in 2017 was 3,000 with a growth rate of 3.1 per annum. The fuelwood and timber consumption per capita per annum was calculated as 1.56 m^3 and 0.43 m^3, respectively. Based on the current consumption patterns the current per capita emissions are 2.18 tons CO_2 eq per annum. Based on this data, current emissions trend from forest degradation are calculated and presented in the **Table 9**.

Table 9. Degradation Emissions trend

	3.1					
Year	**Population**	**Fuelwood Consumption (FC) (m^3/year)**	**Timber Consumption (TC) (m3/year)**	**Fuelwood Emissions (FC*D*BEF2*CF*44/12)[2] (ton CO_2 eq)**	**Timber Emission (TC*D*BEF2*CF*44/12) (ton CO_2 eq)**	**Emission from Forest Degradation (ton CO_2 eq) -Business as usual**
2010	2407	3754	1035	4105	1132	5237
2011	2483	3874	1068	4237	1168	5404
2012	2563	3998	1102	4372	1205	5577
2013	2645	4126	1137	4512	1244	5756
2014	2730	4258	1174	4656	1283	5940
2015	2817	4394	1211	4805	1325	6130
2016	2907	4535	1250	4959	1367	6326
2017	3000	4680	1290	5118	1411	6528
2018	3093	4825	1330	5276	1454	6731
2019	3189	4975	1371	5440	1499	6939
2020	3288	5129	1414	5608	1546	7154
2021	3390	5288	1458	5782	1594	7376
2022	3495	5452	1503	5962	1643	7605
2023	3603	5621	1549	6146	1694	7841
2024	3715	5795	1597	6337	1747	8084
2025	3830	5975	1647	6533	1801	8334
2026	3949	6160	1698	6736	1857	8593

[2] Wood Density (D)

Juniperus Spp.	0.5
Pinus wallichiana	0.43
Picea Smithiana	0.43
Average	0.45

Biomass Expansion Factor: BEF2 1.35 (IPCC Table 3A.1.10)

CF = carbon fraction of dry matter 0.5

	3.1					
Year	**Population**	**Fuelwood Consumption (FC) (m^3/year)**	**Timber Consumption (TC) (m3/year)**	**Fuelwood Emissions (FC*D*BEF2*CF*44/12)[2] (ton CO_2 eq)**	**Timber Emission (TC*D*BEF2*CF*44/12) (ton CO_2 eq)**	**Emission from Forest Degradation (ton CO_2 eq) -Business as usual**
2027	4071	6351	1751	6945	1914	8859
2028	4197	6548	1805	7160	1974	9134
2029	4327	6751	1861	7382	2035	9417
2030	4462	6960	1918	7611	2098	9709
2031	4600	7176	1978	7847	2163	10010
2032	4742	7398	2039	8090	2230	10320

Table 10 provides a net CO_2 sequestration scenario based on 20% forest cover enhancement in addition to existing positive trend and reducing emissions from forest degradation in an incremental manner annually from 5% to 25% with REDD+ activity. The net emissions from the forest will continue declining as a result of increasing forest cover and reducing pressure for fuel wood and local timber demand. The net emissions from the forest with REDD+ can be neutralized by 2029 and from then onwards the forest can become a net sink.

Table 10. Sequestration Scenario from Forest Enhancement and Reducing degradation

Rate of change per year	2668					534	
Year	**Annual Sequestration from forest enhancement (ton CO_2 eq) -Business as usual**	**Annual Emission from Forest Degradation (ton CO_2 eq) -Business as usual**	**Net Emissions (ton CO_2 eq) -Business as usual**	**5-25% gradual Reduction in Degradation emissions scenario (ton CO_2 eq)**	**Net emissions from degradation (ton CO_2 eq)**	**Sequestration from forest enhancement (ton CO_2 eq) - REDD+ with 20% enhancement**	**Net total emissions from forest enhancement and reducing degradation (ton CO_2 eq) - REDD+ implementation**
2010	2668	5237	2569				
2011	2668	5404	2736				
2012	2668	5577	2909				
2013	2668	5756	3088				
2014	2668	5940	3272				

Rate of change per year	2668					534	
Year	Annual Sequestration from forest enhancement (ton CO_2 eq) -Business as usual	Annual Emission from Forest Degradation (ton CO_2 eq) -Business as usual	Net Emissions (ton CO_2 eq) -Business as usual	5-25% gradual Reduction in Degradation emissions scenario (ton CO_2 eq)	Net emissions from degradation (ton CO_2 eq)	Sequestration from forest enhancement (ton CO_2 eq) - REDD+ with 20% enhancement	Net total emissions from forest enhancement and reducing degradation (ton CO_2 eq) - REDD+ implementation
2015	2668	6130	3462				
2016	2668	6326	3658				
2017	2668	6528	3860				
2018	2668	6731	4063				
2019	2668	6939	4271				
2020	2668	7154	4486				
2021	2668	7376	4708				4708
2022	2668	7605	4937	380	7605	3202	4403
2023	2668	7841	5173	392	7448	3735	3713
2024	2668	8084	5416	808	7275	4269	3006
2025	2668	8334	5666	1667	6667	4802	1865
2026	2668	8593	5925	2148	6444	5336	1108
2027	2668	8859	6191	2215	6644	5870	775
2028	2668	9134	6466	2354	6779	6403	376
2029	2668	9417	6749	2354	7062	6937	126
2030	2668	9709	7041	2427	7281	7470	-189
2031	2668	10010	7342	2502	7507	8004	-497
2032	2668	10320	7652	2580	7740	8538	-798

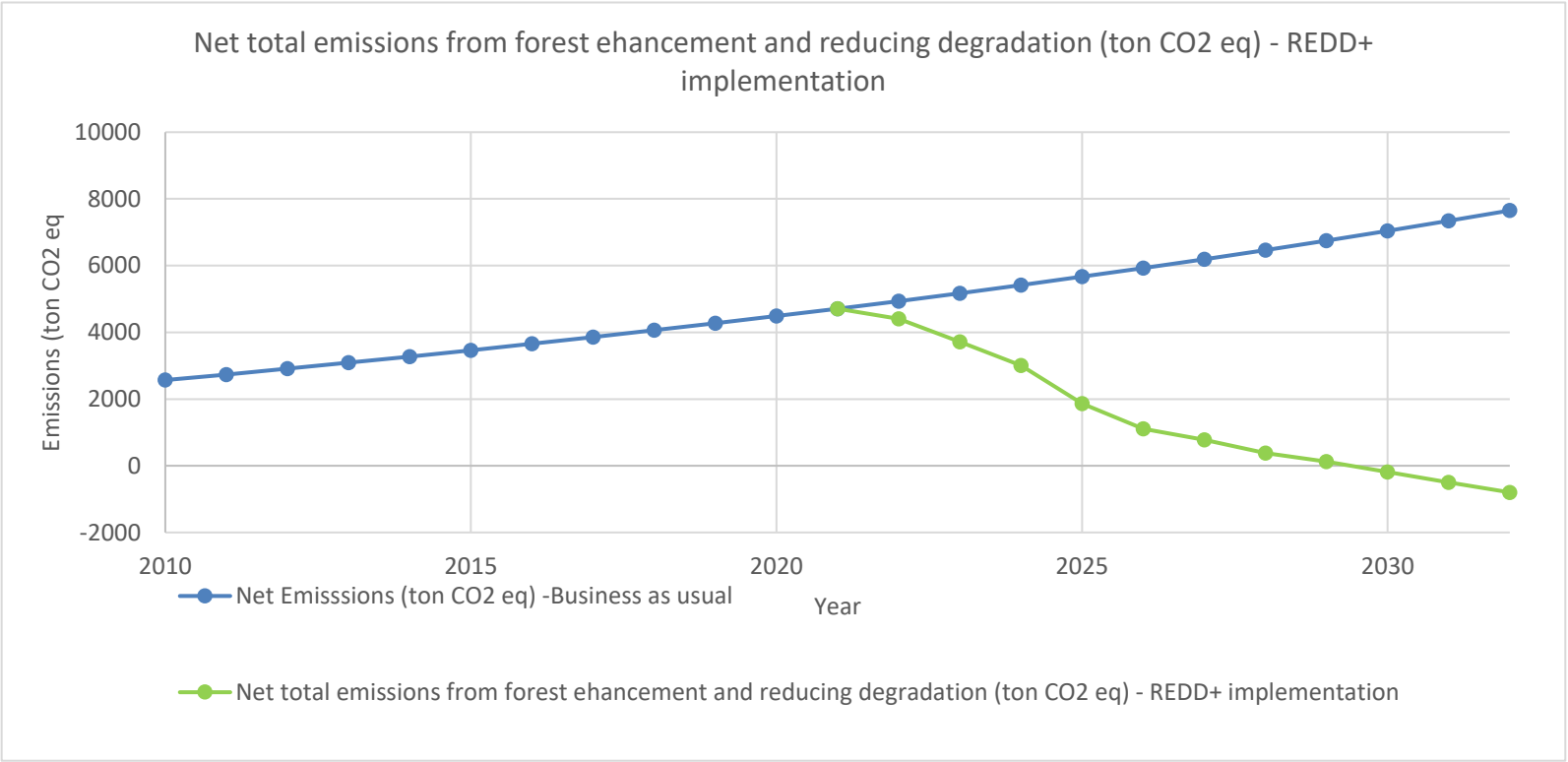


Figure 6. Sequestration scenarios – Forest Enhancement and Reduced degradation

3. Proposed Intervention and Budget

The interventions proposed here are based on the participatory forest inventory, socio-economic data, drivers of deforestation, and analysis of stakeholders. The analysis ascertained that to achieve effective results for sustainable forest management and incremental Carbon sequestration, the activities required under this PFMP need to cater to the larger watershed and related issues in the entire range of forest resources. The following long, medium, and short-term interventions (**Table 11**) are, therefore, suggested for managing the Kaye Forest as a REDD+ pilot site. **Table 12** provides detailed activities and budget for activities to be carried out in 10 years.

Table 11. Proposed interventions to control Drivers of Deforestation and Forest Degradation

	Drivers/Barriers	Activities to curb major drivers and barriers	Verifiable indicators	Means of verification
1	**Deforestation**			
1.1	Large scale harvesting by the government in the past for uses outside the valley	Continue current ban	No new notification to remove ban on harvesting and no harvesting by the government for uses outside the valley	FD notifications/records
		Engage community organization in forest management	MoUs signed/notification indicating community formal community role in forest management	Reports, records
			No. of community Forest Guards/game watchers recruited and trained	Report, records,
		Plantation of forest areas where mother trees are not available	No. of plants planted	FD/community records
		Establish area enclosure for regeneration	No. of enclosure and total areas enclosed for grazing control to promote natural regeneration	FD/Forest records/progress report
1.2	Small scale illegal timber harvesting to sell for cash income in the absence of alternate sources of income	Construction of roads and bridges to promote tourism and increase access to forest for planting and promotion of tourism	No. of bridges constructed Road constructed in Km No. of Tourist facilities developed and manage by locals	FD/community records/case studies,
			% increase in employment due to better access through bridges to new sites.	Case studies and report
		Provide trainings to local community hospitality and tourism management.	No. of community members received trainings in tourism management/NTFP processing/handicrafts.	FD/community records/training report
2	**Degradation**			
2.1	Extraction of timber and fuelwood for	Undertake energy plantations	No. of plants distributed by the FD to the community No. of plants planted by the community	FD/community records/case studies

	Drivers/Barriers	Activities to curb major drivers and barriers	Verifiable indicators	Means of verification
	local uses for . heating during long winters	Provision of electricity as alternate source of fuelwood	Installation of 2-megawatt hydro station % Households reporting increased supply of electricity	PWD/FD/community records,PC1,PCII
		Introduction of fuel-efficient technologies	25% households using fuel efficient technologies	FD/community records/case studies
3	**Major barriers to enhance forest**			
3.1	Livestock grazing is a major barrier to forest restoration.	Controlled grazing in areas allocated for natural regeneration	Total area (hectare) enclosed for restricted grazing	FD/community records/resolutions
3.2	Non-availability of saplings for reforestation	Establish forest nursery to produce sapling	Forest nurseries established No. of plants produced annually in forest nursery	FD/community records
		Sowing in blank areas	Total area (hectare) sown for regeneration of natural forest	FD/community records/field visit reports

Table 12. Indicative operation plan and activity budget for 10 years

				Operational Plan											
1	Check			Short Term				Medium Term			Long Term				
S.N.	Activity	Unit	Unit cost PKR	1	2	3	4	5	6	7	8	9	10	Total units	Total cost PKR
1	Preparation for implementation of PFMP and periodical follow up meetings (community and other stakeholders	Meeting	50,000	3	1	1	1	3	1	1	1	1	3	16	800,000
2	Notification of forums	Notification	0	1										1	0
3	Appointment of 5 community forest guards	Month	60,000	60	60	60	60	60	60	60	60	60	60	600	36,000,000
4	Training /exposure of forest officials and community in accordance with their role in REDD+	Training exposure	200,000	1	2	2								5	10,00,000
5	Provide fast growing plants for development of energy plantations	Plant	60			87000	87000							174000	10,440,000
6	Purchase and planting of tube plants	Plant	80		5000	5000	5000							15000	1,200,000
7	Nursery establishment and maintenance	Plant	40		10000	20000	20000	20000	20000					90,000	36,00,000
8	Planting in blank and sparsely vegetated patches	Plant	40					10,000	20000	20000	20000	20000		90,000	36,00,000
9	Natural regeneration through areas enclosure and social fencing	Hectare	0			200			200					400	00
10	Sowing in blank areas	Hectare	50,000			20	20	20	20	20				100	5,000,000
11	Development of 1 MW hydropower plant for alternative energy	MW	60,000,000				1							1	60,000,000
12	Community / youth motivational events	Event	25,000	2	2	2	2	1	1	1	1	1	1	14	350,000
14	Trainings to promote alternative sources of livelihoods (e.g., hospitality, NTFP, Handicrafts)	Training	200,000		2	2	2							6	12,00,000
15	Construction of 3 km jeepable dirt road to promote tourism and planting campaigns. Thoye 1.5 km, Kaye 0.5 km, Popoye Moti 0.5 km, Beyang nullah 1.5 km	Km	30,00,000			4								4	12,000,000
	Construction of 3 bridges to promote tourism and facilitate planting activities (Thoye, proper Kaye and Popoye Motee)	Bridge	40,00,000			3								3	12,000,000
16	Improved animal production for improved incomes and to decreased grazing pressure on forest (improved breeds, improved feed, animal management)	Household	10,000			100	100	25						225	22,50,000
17	Develop funding proposals to generate funding for PFMP activities	Proposal	10,00,000		1									1	10,00,000
	Total														**159,190,000**

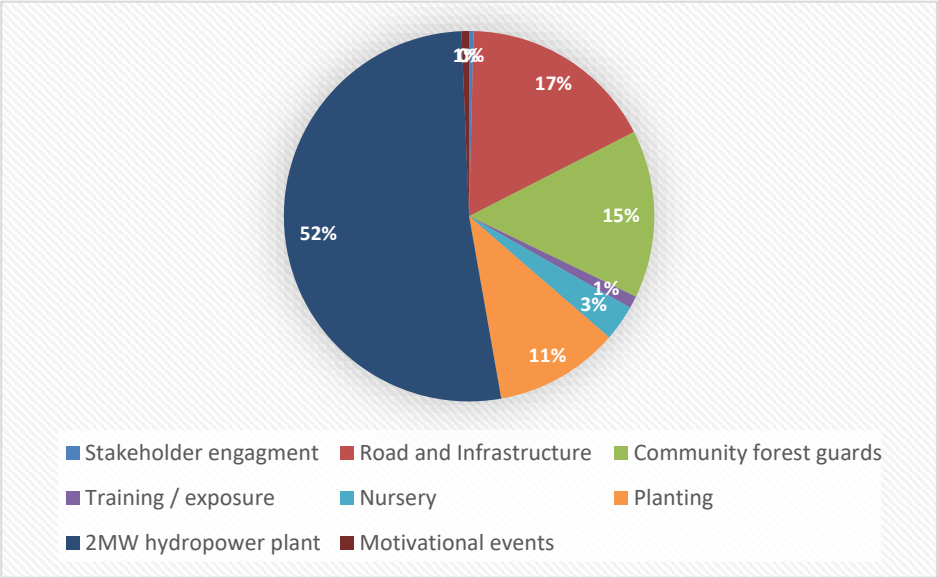


Figure 7. Percentage of Budget for various activities

4. Implementation Mechanism for PFMP

4.1 Resources for activities

The FD as custodian of the forest and having linkages with national and international funding sources will take lead in this activity. The stakeholders identified in this plan, especially the FD and the VCC Gudai and *jirgas* of Gudai and Shekang will jointly look for resources for implementation of activities identified in this plan. The FD will submit proposals for potential funding sources including the MoCC, Public Sector Development Programme (PSDP), international donors and private sector investors.

4.2 Suggested institutional mechanism for implementation of activities

The FD in consultation with the community will decide on formation/notification of suitable institutional mechanism for implementation of this plan. It is suggested that village and district level REDD+ implementation committees notified by the FD will oversee implementation of activities. The notifications will include description of responsibilities of FD, the respective communities, and any other relevant stakeholders.

VRIC: In consultation with the community, the FD may notify two committees. A Village REDD+ Implementation Committee (VRIC) and the District REDD+ Implementation Committee (DRIC). The VRIC may consist of representatives from the community and the FD. The community will nominate representatives for the VRIC to represent them. The representatives of the community will be responsible to ensure and harness community support for the implementation of activities. Representatives of the households having land and settlements inside the forest will be crucial for success of REDD+ activities. The FD will assign duties of a RFO to represent the department in the VRIC. The VRIC may be Co-chaired by a community member nominated by the community and the RFO.

DRIC: The VRIC will be supported by a District level REDD+ Implementation Committee (DRIC) chaired by the Deputy Commissioner and consisting of Divisional Forest Officer, REDD+ Focal Person and two members nominated by the Gudai Shekang VCC including the Chair of the VRIC. The responsibility of the DRIC will be to monitor progress on implementation of activities and harnessing support from the relevant actors including the government departments.

4.3 Benefit Distribution Mechanism

The implementation of the REDD+ interventions package and other support activities will increase the volume of carbon stock in the forest. The increase in carbon stock in the forest pool measured by variable means and the trade of carbon will generate substantial income for the stakeholders of Kaye Forest in due course of time. The income earned by trading carbon stock will be distributed in proportions as per the use rights held by stakeholders. Since the community will be reducing harvest of fuel wood, restrict grazing for encouraging regeneration and voluntarily participate in restocking of forest, they will expect a major share from results-based payments from reduced carbon emissions. An example is the 80:20 benefit sharing mechanism between the community and the FD from trophy hunting programme in Gilgit-Baltistan. For protected forests, the current benefit sharing mechanism is suggested to e replicated at 60:40 basis where 40% is the benefit for the communities (carbon and non-carbon benefit sharing).

A specific and definitive distribution of benefits in case of REDD+ programme is yet to be developed by the FD which will form basis for sharing of benefits in the case of private forests. These proposed ratio will be finalized or confirmed only after finalizing GB based benefit sharing mechanism.

5. Conflict and grievance redressal mechanism

5.1 Conflict within the community

Traditionally, a *jirga* system resolves conflicts within the community and the decisions taken are acceptable for the parties. Under REDD+ redressal, it is suggested that the same *jirga* may take lead role to resolve conflicts arising among the community regarding implementation of REDD+ activities. The structure and function of *jirga* system has been described in earlier section in this document.

5.2 Conflict between the two villages

The VCC Gudai and Shekang with the help of *jirgas* of both the village will settle any disputes between the two villages. Any unsettled disputes will be referred to the district implementation committee. If conflicts are still not resolved, the matter will be taken up to the court of the formal judicial system.

5.3 Community's grievance towards the Forest Department

The REDD+ is a new mechanism for communities as well as for the FD, therefore, both partners (Community and the FD might be facing some conflict of interest in due course of time. In case of any such grievances arise, these will be dealt through the grievance redressal mechanism developed under the REDD+ obligation. This mechanism is also reflected well in Provincial REDD+ Action Plan.

References:

1. ADB, (2017). Climate change profile of Pakistan. Asian Development Bank 6 ADB Avenue, Mandaluyong City, 1550 Metro Manila, Philippines
2. Bilal, H, Chamhuri, S; Mokhtar, M; Kanniah, K. (2019). Recent Snow Cover Variation in the Upper Indus Basin of Gilgit Baltistan, Hindukush Karakoram Himalaya. Journal of Mountain Science. 16. 296-308. 10.1007/s11629-018-5201-3.
3. FAO (2020). Global Forest Resources Assessment 2020 – Key findings. Rome. https://doi.org/10.4060/ca8753en
4. FAO (2021). REDD+ Reducing Emissions from Deforestation and Forest Degradation. Available at https://fao.org/redd/en.
5. Francis S., and Nancy H.,(2019). "Reducing Tropical Deforestation," Science, vol. 365, no. 6455 (2019), pp. 756- 757.
6. GB-EPA (2017). Gilgit-Baltistan Climate Change Strategy and Action Plan 2017. Gilgit-Baltistan Environmental Protection Agency (GB-EPA) website: http://www.gbepa.gog.pk/ Government of Gilgit-Baltistan
7. GCISC (2018). Pakistan's second national communication on climate change. gcisc.org.pk/SNC_Pakistan.pdf.
8. GoP (2021). Pakistan's intended Nationally Determined Contributions. Available at https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Pakistan%20First/Pakistan%20Updated%20NDC%202021.pdf. Accessed Jan, 17, 2022
9. GoP (2010). Task force on Climate Change. Planning Commission, Government of Pakistan (GoP). WWW.gcisc.org.pk/TFCC%20Final%20Report.pdf.
10. GoP (2015). National Forest Policy. Available at; https://pbit.punjab.gov.pk/system/files/National%20Forest%20Policy%202016.pdf
11. GOP (2019). Forest Reference Emission Levels, In the Context of Decision 1/CP.16 para 70 UNFCCC. Available at: https://redd.unfccc.int/files/frel_pakistan_nro_06january_finalsubmitted.pdf
12. GoP (2020). Gilgit-Baltistan at a Glance. Planning and Development Department, Statistical and Research Cell (SRC). Available at; https://portal.pnd.gog.pk/Content/Files/Reports/Gilgit%20Baltistan%20at%20a%20Glance%20New%20Design%202020%20Final_210554160.pdf
13. Ismail, I., Sohail, M., Gilani H., Ali A, Hussain, K., Hussain K., Karky B, S., Qamar G, F, M., Qazi, W., Ning, W., and Kortu, R., (2018). Forest inventory and analysis in Gilgit-Baltistan. A contribution towards developing a forest inventory for all Pakistan-2018.pdf
14. Khan, B., Khan, M.Z., Khan, G. (2009). Does agro forestry help protect natural forests in semi arid environs. The Pakistan Journal of Forestry. Vol.59(1), 2009.
15. Kissinger, G., Herold, M., de Sy, V., 2012. Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers. The Government of the UK and Norway.
16. Le Quéré, C., Moriarty, R., Andrew, R.M., Canadell, J.G., Sitch, S., Korsbakken, J.I., Friedlingstein, P., Peters, G.P., Andres, R.J., Boden, T.A., 2015. Global carbon budget 2015. Earth Syst. Sci. Data 7, 349–396
17. Qamer, Shehzad, K., Abbas, S., Murthy, M. S. R., Xi, C., Gilani, H., & Bajracharya, B. (2016). Mapping Deforestation and Forest Degradation Patterns in Western Himalaya, Pakistan. *Remote Sensing (Basel, Switzerland)*, *8*(5), 385. https://doi.org/10.3390/rs8050385
18. UNFCC (2021). What is REDD+?. Available at https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd.
19. Ullah, Noor, R. S., Abid, A., Mendako, R. K., Waqas, M. M., Shah, A. N., & Tian, G. 2021. Socio-Economic Impacts of Livelihood from Fuelwood and Timber Consumption on the Sustainability of Forest Environment: Evidence from Basho Valley, Baltistan, Pakistan. *Agriculture (Basel)*, *11*(7), 596. https://doi.org/10.3390/agriculture11070596

Plot No.	Latitude	Longitude	Tree ID	Species Name (Local Name)	Tree Specie (Scientific Name)	DBH (cm)	Tree height (m)	Dry AGB (kg) 1	AGB (ton/ha)	AGC (ton/ha) 2	BGC (ton/ha) 3
1	35.1623	74.9803	1	Kail	*Pinus wallichiana*	173.7	20.1	7,722	77.22	36.29	9.07
1	35.1623	74.9803	2	Kail	*Pinus wallichiana*	170.6	21.7	8,003	80.03	37.61	9.4
1	35.1623	74.9803	3	Kail	*Pinus wallichiana*	225.5	26.9	15,795	157.95	74.24	18.56
1	35.1623	74.9803	4	Kail	*Pinus wallichiana*	188.9	26.8	11,528	115.28	54.18	13.55
1	35.1623	74.9803	5	Kail	*Pinus wallichiana*	216.4	19.1	10,869	108.69	51.09	12.77
1	35.1623	74.9803	6	Kail	*Pinus wallichiana*	149.3	23.3	6,738	67.38	31.67	7.92
1	35.1623	74.9803	7	Juniper	*Juniperus Spp.*	42.3	4	288	2.88	1.35	0.34
2	35.1614	74.9832	1	Juniper	*Juniperus Spp.*	137.1	10	2,131	21.31	10.02	2.5
2	35.1614	74.9832	2	Juniper	*Juniperus Spp.*	82.2	10	892	8.92	4.19	1.05
2	35.1614	74.9832	3	Juniper	*Juniperus Spp.*	79.2	9.5	837	8.37	3.93	0.98
2	35.1614	74.9832	4	Kail	*Pinus wallichiana*	39.6	9.4	293	2.93	1.38	0.34
2	35.1614	74.9832	5	Juniper	*Juniperus Spp.*	60.9	4	535	5.35	2.51	0.63
2	35.1614	74.9832	6	Kail	*Pinus wallichiana*	17.7	3.4	29	0.29	0.14	0.03
2	35.1614	74.9832	7	Juniper	*Juniperus Spp.*	17.8	4	66	0.66	0.31	0.08
2	35.1614	74.9832	8	Kail	*Pinus wallichiana*	131	10	2,543	25.43	11.95	2.99
2	35.1614	74.9832	9	Juniper	*Juniperus Spp.*	64	7.7	582	5.82	2.74	0.68
2	35.1614	74.9832	10	Juniper	*Juniperus Spp.*	64	7.7	582	5.82	2.74	0.68
2	35.1614	74.9832	11	Kail	*Pinus wallichiana*	73.1	7.9	740	7.4	3.48	0.87
2	35.1614	74.9832	12	Kail	*Pinus wallichiana*	143.2	20.6	5,618	56.18	26.4	6.6
2	35.1614	74.9832	13	Juniper	*Juniperus Spp.*	51.8	3.5	406	4.06	1.91	0.48
2	35.1614	74.9832	14	Juniper	*Juniperus Spp.*	22.8	3.9	100	1	0.47	0.12
2	35.1614	74.9832	15	Kail	*Pinus wallichiana*	149.3	17	5,106	51.06	24	6

Plot No.	Latitude	Longitude	Tree ID	Species Name (Local Name)	Tree Specie (Scientific Name)	DBH (cm)	Tree height (m)	Dry AGB (kg) 1	AGB (ton/ha)	AGC (ton/ha) 2	BGC (ton/ha) 3
2	35.1614	74.9832	16	Kail	*Pinus wallichiana*	54.8	7	401	4.01	1.88	0.47
2	35.1614	74.9832	17	Kail	*Pinus wallichiana*	182.8	22.4	9,293	92.93	43.68	10.92
2	35.1614	74.9832	18	Kail	*Pinus wallichiana*	182.8	23.6	9,730	97.3	45.73	11.43
2	35.1614	74.9832	19	Kail	*Pinus wallichiana*	124.9	25	5,237	52.37	24.61	6.15
2	35.1614	74.9832	20	Juniper	*Juniperus Spp.*	48.7	7	366	3.66	1.72	0.43
2	35.1614	74.9832	21	Juniper	*Juniperus Spp.*	64	6.5	582	5.82	2.74	0.68
2	35.1614	74.9832	22	Kail	*Pinus wallichiana*	106.6	14.3	2,424	24.24	11.39	2.85
2	35.1614	74.9832	23	Kail	*Pinus wallichiana*	170.6	18.1	6,822	68.22	32.06	8.02
2	35.1614	74.9832	25	Kail	*Pinus wallichiana*	182.8	18.9	8,003	80.03	37.61	9.4
2	35.1614	74.9832	26	Juniper	*Juniperus Spp.*	45.7	5.2	328	3.28	1.54	0.39
3	35.1592	74.9847	1	Kail	*Pinus wallichiana*	118.8	22.3	4,336	43.36	20.38	5.1
3	35.1592	74.9847	2	Kail	*Pinus wallichiana*	137.1	25.2	6,213	62.13	29.2	7.3
3	35.1592	74.9847	3	Kail	*Pinus wallichiana*	118.8	26	4,963	49.63	23.33	5.83
3	35.1592	74.9847	4	Kail	*Pinus wallichiana*	67	18	1,311	13.11	6.16	1.54
3	35.1592	74.9847	5	Kail	*Pinus wallichiana*	170.6	26	9,382	93.82	44.1	11.02
3	35.1592	74.9847	6	Kail	*Pinus wallichiana*	64	10.5	753	7.53	3.54	0.88
3	35.1592	74.9847	7	Kail	*Pinus wallichiana*	140.2	20.1	5,297	52.97	24.89	6.22
3	35.1592	74.9847	8	Kail	*Pinus wallichiana*	161.5	25	8,231	82.31	38.68	9.67
3	35.1592	74.9847	9	Kail	*Pinus wallichiana*	85.3	14.7	1,678	16.78	7.89	1.97
3	35.1592	74.9847	10	Kail	*Pinus wallichiana*	164.5	27	9,097	90.97	42.76	10.69
3	35.1592	74.9847	11	Kail	*Pinus wallichiana*	161.5	28.6	9,265	92.65	43.55	10.89
3	35.1592	74.9847	12	Kail	*Pinus wallichiana*	161.5	24	7,940	79.4	37.32	9.33
3	35.1592	74.9847	13	Kail	*Pinus wallichiana*	91.4	17.3	2,186	21.86	10.28	2.57

Plot No.	Latitude	Longitude	Tree ID	Species Name (Local Name)	Tree Specie (Scientific Name)	DBH (cm)	Tree height (m)	Dry AGB (kg) 1	AGB (ton/ha)	AGC (ton/ha) 2	BGC (ton/ha) 3
3	35.1592	74.9847	14	Kail	*Pinus wallichiana*	131	13.5	3,312	33.12	15.56	3.89
3	35.1592	74.9847	15	Kail	*Pinus wallichiana*	45.7	11.5	451	4.51	2.12	0.53
4	35.1544	74.9879	1	Kail	*Pinus wallichiana*	128	20.1	4,513	45.13	21.21	5.3
4	35.1544	74.9879	2	Spruce	*Picea smithiana*	103.6	19	2,655	26.55	12.48	3.12
4	35.1544	74.9879	3	Spruce	*Picea smithiana*	67	17	1,154	11.54	5.43	1.36
4	35.1544	74.9879	4	Spruce	*Picea smithiana*	67	18.5	1,240	12.4	5.83	1.46
4	35.1544	74.9879	5	Spruce	*Picea smithiana*	22.8	7.5	93	0.93	0.44	0.11
4	35.1544	74.9879	6	Spruce	*Picea smithiana*	73.1	11.5	961	9.61	4.52	1.13
4	35.1544	74.9879	7	Kail	*Pinus wallichiana*	60.9	12	776	7.76	3.65	0.91
4	35.1544	74.9879	8	Kail	*Pinus wallichiana*	60.9	12	776	7.76	3.65	0.91
4	35.1544	74.9879	9	Kail	*Pinus wallichiana*	91.4	12	1,585	15.85	7.45	1.86
4	35.1544	74.9879	10	Kail	*Pinus wallichiana*	22.8	6.5	80	0.8	0.38	0.09
4	35.1544	74.9879	11	Spruce	*Picea smithiana*	137.1	21	4,645	46.45	21.83	5.46
5	35.1623	74.9915	1	kail	*Pinus wallichiana*	198.1	27	12,617	126.17	59.3	14.82
5	35.1623	74.9915	2	kail	*Pinus wallichiana*	164.5	28	9,393	93.93	44.15	11.04
5	35.1623	74.9915	3	kail	*Pinus wallichiana*	155.4	26	7,962	79.62	37.42	9.35
5	35.1623	74.9915	4	kail	*Pinus wallichiana*	182.8	28.2	11,380	113.8	53.48	13.37
5	35.1623	74.9915	5	kail	*Pinus wallichiana*	140	19.4	5,121	51.21	24.07	6.02
5	35.1623	74.9915	6	kail	*Pinus wallichiana*	161.5	26.5	8,664	86.64	40.72	10.18
5	35.1623	74.9915	7	kail	*Pinus wallichiana*	152.4	24	7,170	71.7	33.7	8.42
5	35.1623	74.9915	8	kail	*Pinus wallichiana*	128	24.1	5,294	52.94	24.88	6.22
5	35.1623	74.9915	9	kail	*Pinus wallichiana*	167.6	25.4	8,909	89.09	41.87	10.47
5	35.1623	74.9915	10	kail	*Pinus wallichiana*	179.8	30	11,672	116.72	54.86	13.71

Plot No.	Latitude	Longitude	Tree ID	Species Name (Local Name)	Tree Specie (Scientific Name)	DBH (cm)	Tree height (m)	Dry AGB (kg) 1	AGB (ton/ha)	AGC (ton/ha) 2	BGC (ton/ha) 3
5	35.1623	74.9915	11	kail	*Pinus wallichiana*	131	27.5	6,193	61.93	29.11	7.28
6	35.1567	74.9943	1	kail	*Pinus wallichiana*	176.7	28.4	10,787	107.87	50.7	12.67
6	35.1567	74.9943	2	kail	*Pinus wallichiana*	173.7	28	10,337	103.37	48.58	12.15
6	35.1567	74.9943	3	kail	*Pinus wallichiana*	131	24	5,494	54.94	25.82	6.46
6	35.1567	74.9943	4	kail	*Pinus wallichiana*	134.1	26.5	6,246	62.46	29.36	7.34
6	35.1567	74.9943	5	kail	*Pinus wallichiana*	106.6	19.3	3,156	31.56	14.83	3.71
6	35.1567	74.9943	6	kail	*Pinus wallichiana*	140.2	26	6,643	66.43	31.22	7.81
6	35.1567	74.9943	7	kail	*Pinus wallichiana*	146.3	25.2	6,965	69.65	32.74	8.18
6	35.1567	74.9943	8	kail	*Pinus wallichiana*	109.7	17	2,968	29.68	13.95	3.49
6	35.1567	74.9943	9	kail	*Pinus wallichiana*	97.5	21	2,905	29.05	13.65	3.41
6	35.1567	74.9943	10	kail	*Pinus wallichiana*	155.44	26.5	8,100	81	38.07	9.52
6	35.1567	74.9943	12	kail	*Pinus wallichiana*	219.4	28	15,591	155.91	73.28	18.32
6	35.1567	74.9943	13	kail	*Pinus wallichiana*	161.5	26.5	8,664	86.64	40.72	10.18
6	35.1567	74.9943	14	kail	*Pinus wallichiana*	132	21	4,951	49.51	23.27	5.82
6	35.1567	74.9943	15	kail	*Pinus wallichiana*	132	22.3	5,220	52.2	24.53	6.13
6	35.1567	74.9943	17	Kail	*Pinus wallichiana*	121.9	22.4	4,555	45.55	21.41	5.35
6	35.1567	74.9943	18	kail	*Pinus wallichiana*	112.7	21.8	3,874	38.74	18.21	4.55
6	35.1567	74.9943	19	kail	*Pinus wallichiana*	112.7	21.8	3,874	38.74	18.21	4.55
6	35.1567	74.9943	20	kail	*Pinus wallichiana*	91.4	22.8	2,788	27.88	13.1	3.28
6	35.1567	74.9943	21	Kail	*Pinus wallichiana*	234.6	22.8	14,641	146.41	68.81	17.2
6	35.1567	74.9943	22	kail	*Pinus wallichiana*	164.5	29.6	9,864	98.64	46.36	11.59
6	35.1567	74.9943	23	kail	*Pinus wallichiana*	204.2	26.7	13,178	131.78	61.94	15.48
7	35.1567	74.9947	1	Kail	*Pinus wallichiana*	182.8	26	10,595	105.95	49.8	12.45

Plot No.	Latitude	Longitude	Tree ID	Species Name (Local Name)	Tree Specie (Scientific Name)	DBH (cm)	Tree height (m)	Dry AGB (kg) 1	AGB (ton/ha)	AGC (ton/ha) 2	BGC (ton/ha) 3
7	35.1567	74.9947	2	Kail	*Pinus wallichiana*	70.1	11	920	9.2	4.33	1.08
7	35.1567	74.9947	3	Kail	*Pinus wallichiana*	158.4	25.5	8,095	80.95	38.04	9.51
7	35.1567	74.9947	4	Juniper	*Juniperus Spp.*	33.5	4.5	193	1.93	0.91	0.23
7	35.1567	74.9947	5	Kail	*Pinus wallichiana*	45.7	8	328	3.28	1.54	0.38
7	35.1567	74.9947	6	Kail	*Pinus wallichiana*	167.6	24.5	8,631	86.31	40.56	10.14
7	35.1567	74.9947	7	Kail	*Pinus wallichiana*	161.5	23	7,649	76.49	35.95	8.99
7	35.1567	74.9947	8	Juniper	*Juniperus Spp.*	12.7	2	37	0.37	0.17	0.04
7	35.1567	74.9947	9	Juniper	*Juniperus Spp.*	15.2	3	50	0.5	0.24	0.06
7	35.1567	74.9947	10	Juniper	*Juniperus Spp.*	20.3	3	82	0.82	0.39	0.1
7	35.1567	74.9947	11	Juniper	*Juniperus Spp.*	15.24	3	51	0.51	0.24	0.06
7	35.1567	74.9947	12	Kail	*Pinus wallichiana*	234.6	25	15,877	158.77	74.62	18.66
7	35.1567	74.9947	13	Kail	*Pinus wallichiana*	45.72	8	328	3.28	1.54	0.39
7	35.1567	74.9947	14	Kail	*Pinus wallichiana*	22.8	7	86	0.86	0.4	0.1
7	35.1567	74.9947	15	Kail	*Pinus wallichiana*	42.6	7.5	274	2.74	1.29	0.32
7	35.1567	74.9947	16	Kail	*Pinus wallichiana*	182.8	26.2	10,667	106.67	50.13	12.53
7	35.1567	74.9947	17	Kail	*Pinus wallichiana*	51.8	6.5	340	3.4	1.6	0.4
7	35.1567	74.9947	18	Kail	*Pinus wallichiana*	167.6	25.5	8,940	89.4	42.02	10.5
7	35.1567	74.9947	19	Kail	*Pinus wallichiana*	164.5	24.3	8,292	82.92	38.97	9.74
7	35.1567	74.9947	20	Kail	*Pinus wallichiana*	131	22.2	5,130	51.3	24.11	6.03
7	35.1567	74.9947	21	Kail	*Pinus wallichiana*	131	20.5	4,783	47.83	22.48	5.62
7	35.1567	74.9947	22	Kail	*Pinus wallichiana*	137.1	23.2	5,777	57.77	27.15	6.79
7	35.1567	74.9947	23	Kail	*Pinus wallichiana*	167.6	26.5	9,248	92.48	43.46	10.87
7	35.1567	74.9947	24	Kail	*Pinus wallichiana*	195	26.8	12,191	121.91	57.3	14.32

Plot No.	Latitude	Longitude	Tree ID	Species Name (Local Name)	Tree Specie (Scientific Name)	DBH (cm)	Tree height (m)	Dry AGB (kg) 1	AGB (ton/ha)	AGC (ton/ha) 2	BGC (ton/ha) 3
7	35.1567	74.9947	25	Kail	*Pinus wallichiana*	73.1	12	1,070	10.7	5.03	1.26
7	35.1567	74.9947	26	Kail	*Pinus wallichiana*	36.5	9	245	2.45	1.15	0.29
7	35.1567	74.9947	27	Kail	*Pinus wallichiana*	91.4	16	2,041	20.41	9.59	2.4
7	35.1567	74.9947	28	Kail	*Pinus wallichiana*	167.6	23	8,164	81.64	38.37	9.59
8	35.1518	74.9987	1	Kail	*Pinus wallichiana*	179.8	22	8,884	88.84	41.76	10.44
8	35.1518	74.9987	2	Kail	*Pinus wallichiana*	207.2	22.5	11,631	116.31	54.66	13.67
8	35.1518	74.9987	3	Kail	*Pinus wallichiana*	60.9	6	422	4.22	1.98	0.5
8	35.1518	74.9987	4	Kail	*Pinus wallichiana*	149.3	19	5,631	56.31	26.46	6.62
8	35.1518	74.9987	5	Kail	*Pinus wallichiana*	115.8	17	3,265	32.65	15.35	3.84
8	35.1518	74.9987	6	Kail	*Pinus wallichiana*	109.7	15.8	2,783	27.83	13.08	3.27
8	35.1518	74.9987	7	Kail	*Pinus wallichiana*	176.7	17.5	7,045	70.45	33.11	8.28
8	35.1518	74.9987	8	Kail	*Pinus wallichiana*	179.8	20.5	8,349	83.49	39.24	9.81
8	35.1518	74.9987	9	Kail	*Pinus wallichiana*	20.3	4.5	47	0.47	0.22	0.06
8	35.1518	74.9987	10	Kail	*Pinus wallichiana*	188.9	24.5	10,653	106.53	50.07	12.52
8	35.1518	74.9987	11	Kail	*Pinus wallichiana*	240.7	26	17,194	171.94	80.81	20.2
8	35.1518	74.9987	12	Kail	*Pinus wallichiana*	161.5	23.5	7,795	77.95	36.63	9.16
8	35.1518	74.9987	13	Kail	*Pinus wallichiana*	164.5	23.2	7,961	79.61	37.42	9.35
8	35.1518	74.9987	14	Juniper	*Juniperus Spp.*	15.2	3	50	0.5	0.24	0.06
8	35.1518	74.9987	15	Juniper	*Juniperus Spp.*	12.7	2.5	37	0.37	0.17	0.04
9	35.1631	74.9842	1	Kail	*Pinus wallichiana*	155.4	22.5	7,011	70.11	32.95	8.24
9	35.1631	74.9842	2	Juniper	*Juniperus Spp.*	22.8	3	100	1	0.47	0.12
9	35.1631	74.9842	3	Kail	*Pinus wallichiana*	42.6	6	225	2.25	1.06	0.26
9	35.1631	74.9842	4	Kail	*Pinus wallichiana*	213.3	26.5	14,135	141.35	66.43	16.61

Plot No.	Latitude	Longitude	Tree ID	Species Name (Local Name)	Tree Specie (Scientific Name)	DBH (cm)	Tree height (m)	Dry AGB (kg) 1	AGB (ton/ha)	AGC (ton/ha) 2	BGC (ton/ha) 3
9	35.1631	74.9842	5	Juniper	*Juniperus Spp.*	17.7	3	65	0.65	0.31	0.08
9	35.1631	74.9842	6	Kail	*Pinus wallichiana*	79.2	11.5	1,186	11.86	5.58	1.39
9	35.1631	74.9842	7	Kail	*Pinus wallichiana*	152.4	21.4	6,482	64.82	30.47	7.62
9	35.1631	74.9842	8	Kail	*Pinus wallichiana*	140.2	13	3,610	36.1	16.97	4.24
9	35.1631	74.9842	9	Kail	*Pinus wallichiana*	124.9	14.5	3,243	32.43	15.24	3.81
9	35.1631	74.9842	10	Kail	*Pinus wallichiana*	126.7	12.4	2,898	28.98	13.62	3.4
9	35.1631	74.9842	11	Juniper	*Juniperus Spp.*	12.7	2.5	37	0.37	0.17	0.04

I. Stakeholder group (names)	Communities of Gudai and Shekang villages - Users of Kaye Forest
2. General information Location of stakeholder groups (e.g., different villages/hamlets in and outside forest area) and names and indicate on map if possible	See Figure 1 for location of Gudai and Shekang villages, settlements, and irrigated lands of some households of Gudai and Shekang in some places inside the forest
3. Social organization in the forest area	
A. Traditional organizations (e.g., jirga)	
Organization (name; purpose; membership)	*Jirga* of Shekang / managing matters related to village including communal resources and conflict resolution/ all households through selected members
Organization (name; purpose; membership	*Jirga* of Gudai / managing matters related to village including communal resources and conflict resolution / all households through selected members
Organization (name; purpose; membership	VCC Gudai / Protection of Kaye and other forests where the Gudai valley has use rights / all households of Gudai represented by members selected by each group for the VCC
B. Formal organization (e.g., social; welfare organization or village development committee	**None**
Organization (name; purpose; membership)	None
Organization (name; purpose; membership)	None
4. Use of forest and forest area (for what are you using the forest area?)	
Timber for personal use like house construction, etc. (where; locate on the map)	Yes, all over the forest
Timber for commercial selling (where; locate on the map)	No
Firewood (where; locate on the map)	Yes, all over the forest except few inaccessible high-altitude areas
Grazing (where; locate on the map)	Yes, all over the forest, except irrigated lands and pastures owned by some households of Gudai and Shekang inside the forest
Grass cutting (where; locate on the map	No, except from irrigated pastures by owners of irrigated land
Other products, e.g., mushroom, pine nuts, pine needles, vegetables, stones, minerals, medicinal plants (where; locate on the map)	Mushrooms, pine needles, medicinal plants from all over the forest
Forest areas related daily labour/employment (employed by whom; for what?)	No. Few members harvest wood for sale for cash income
Tourism (what; where; locate on the map)	No existing tourist facilities. Potential exists especially in cultivated and accessible areas owned by some households of Gudai and Shekang inside forest which are shown in Figure 1
Hunting/Fishing	Fishing in Chilum and Bubind Rivers with license from the Fisheries Department. However, illegal fishing was reported being common. Rare illegal hunting is also assumed.

What would it mean if you had no access to these forest products? (Any alternatives? Threat to livelihood?)	People have to buy costly substitute of energy (mainly LPG) and construction material (concrete) and fodder. People will not afford buying these products if access to forest products is not available. People would be forced to migrate if grazing, timber, and firewood is not allowed.
5. Rights and concessions in forest area	
Do you have formal, legal, or traditional, customary rights on forest products (use)? Which ones? If documented rights, where?	Yes, all uses are allowed unless restricted by the government as per Forest Act 1927 except timber for which written permission is required from the Forest Department
Timber (shares)	Timber as per need through permission from Forest Department
Fodder: grass cutting/grazing	Yes
Firewood	Yes (dead fallen, and pruning of trees)
Other products:	Yes (NTFP) mainly mushrooms
6. Conflicts / disputes	
On different land uses: Describe nature of conflict, between which groups and put location on map if possible	When the community of Gudai banned extraction of wood for use outside the Gudai valley from Kaye and adjacent forest in 1990s, communities beyond Gudai along the Gudai Makyal road agitated because they have been harvesting timber and firewood from forests adjacent to Kaye. After many *Jirgas* and intervention by religious leaders, the case was taken to the court. No decision has been taken yet but the issue seem to have died as wood is not being taken beyond the check post originally established by the Gudai community and now managed by the Forest Department. The FD does not allow wood transportation beyond the jurisdiction of Gudai.
Do they have effect on forest management? And how?	Now the issue seems settled and has no negative impact on forest management. In the past wood on large scale was extracted to be used outside the Gudai valley and the forest has severely degraded. The data collected for this document indicates that the forest is now regenerating as a result of decreased extraction after ban on wood transportation outside Gudai valley.
On social issues: Describe nature of conflict, between which groups and put location on map if possible	None
Do they have effect on forest management? And How?	None
Existing Conflict resolution mechanisms: - traditional (e.g., jirga) - formal (court)	Through local *Jirga*, FD, Revenue Department, and Court of Law.
7. Other Forest Management Projects	
Are there any other Forest Management Projects in the area? If so, which projects? What are their activities?	AKRSP, TBTTP and ETI GB. AKRSP distributed forest plants in Gudai and Shekang. ETI has supported widening of an irrigation channel in Gudai. These interventions are expected to increase cultivated areas and irrigated plantations. This may have a positive impact on Kaye and other adjacent forests as firewood from irrigated plantations will be also available. TBTTP is expected to contribute to this end in the future.