



A Feasibility Study Report on Wood Seasoning and Treatment Plant Establishment at Chautara Sangachowkgadi Municipality

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Abbreviation

AAH	Annual Allowable Harvest
AC	Accounts Committee
AFO	Assistant Forest Officer
ACIAR	Australian Centre for International Agricultural Research
CCA	Copper Chrome Arsenic
CFUG	Community Forest User Group
DDC	District Development Committee
DFO	Division Forest Office
DoF	Department of Forest
EC	Executive Committee
EnLIFT	Enhancing Livelihoods from Improved Forest Management in Nepal
FECOFUN	Federation of Community Forest Users Nepal
GA	General Assembly
GHG	Green House Gases
IEE	Initial Environmental Examination
m ³	Cubic meter
MoFSC	Ministry of Forest and Soil Conservation
NS	Nepal Quality Certification Mark
OP	Operational Plan
PAN	Permanent Account Number
VDC	Village Development Committee

Executive Summary

The "Enhancing Livelihoods from Improved Forest Management in Nepal" project (EnLiFT 2) is a forestry research initiative supported by funding from the Australian Government through the Australian Centre for International Agricultural Research (ACIAR). This report discussed the feasibility study undertaken as a collaborative activity between EnLiFT 2 and Chautara Sangachowkgadi Municipality to discern the viability of establishing a pine wood-based enterprise involving wood seasoning and treatment in Sindhupalchowk.

The study was conducted between August to December 2023. which included desk review of available reports and relevant documents; forest inventory in representative forests; consultation with municipality through focus group discussion, workshops, meetings in person, telephone communication; sharing for feedback; and field observations. Various factors were examined during this study including resources, markets, institutional modalities and investment modalities, environmental impacts, and policies.

The community forest in this municipality is projected to annual harvest approximately 7,461.64 cubic meters, with an additional harvest of about 5,677.47 cubic meters from external sources, including private forests, leasehold forests, and private land. The forest in this municipality showcases a diverse species composition, with Pate Salla accounting for 53%, Gobre Salla at 9%, Utish at 12%, Chilaune at 13%, and the remaining 13% comprising various other species. Specifically, an annual harvestable volume of 3,954.67 cubic meters is designated for Pate Salla.

Following discussions with furniture manufacturers in the Kathmandu Valley, it has been identified that there is a substantial demand for seasoned wood, and these manufacturers express eagerness to enter a contract for a sustainable supply of seasoned and treated materials. Market promotion efforts are anticipated to eliminate any potential challenges in the market for treated timbers. The recommended approach for establishing the treatment plant involves a public-private partnership model, where Chautara municipality will bear 50% of both capital and operational expenses. The remaining 50% of operational expenses will be the responsibility of the private sector, which will generate revenue through the provision of treatment services. To ensure effective management, an independent management team is proposed under an executive committee, consisting of 13 members, aimed at ensuring the long-term sustainability of the treatment plant.

The total establishment costs are estimated at 28 million rupees, with the municipality expected to contribute nearly 50%, and the remaining 50% to be covered by the private sector. Initial projections indicate that the treatment plant is anticipated to generate a profit of 14.93% in the first year, with a complete recovery of all investments expected within the next five years.

The selection of the plant's potential site underwent a comprehensive analysis, leading to the identification of Jalkuni and Dolalghat as the optimal locations. The proposed treatment plant is poised to yield potential environmental and social benefits in both the resource areas and the plant establishment zones. Environmental advantages include enhanced biodiversity, increased forest

growth, augmented local employment opportunities, long-term carbon storage, heightened carbon sequestration, and additional income for Community Forest User Groups (CFUGs), among other benefits. The identified negative impacts are minimal and can be easily mitigated.

Based on analysis in all aspects, the study recommends that establishment of multipurpose pine wood treatment plant is feasible. However, several issues have been identified to be resolved. Major recommendations are listed below.

- The Public-Private Partnership (PPP) model emerged as the most suitable option, considering factors such as increased capital infusion, specialized expertise, efficient management practices, risk-sharing mechanisms, innovation potential, scalability, and the robust regulatory oversight inherent in PPP arrangements.
- An experimental policy or regulatory mechanism is essential to establish connections with the markets in Kathmandu Valley and cross-border markets to ensure a stable market for treated timber. Urgent actions include policy reviews and a comprehensive market study for exporting seasoned and treated timber.
- Addressing concerns raised by buyers regarding the quality of treated timber, its strength, and durability is crucial. To provide quality assurance, official certification, such as the Nepal Quality Certification Mark (NS), is recommended. This necessitates further research on treatment, strength, and durability to develop appropriate standards.
- It is essential to highlight the importance of streamlining the OP revision process with the goal of reducing costs, particularly when the OP is under the ownership of the CFUG, and simultaneously meeting local demand. CFUGs require technical support for the revision of their operational plans, emphasizing Sustainable Forest Management procedures outlined in the Bagmati province's 2079 guidelines.
- Community reorientation on forest management and awareness of relevant laws and regulations are necessary for the involved communities. Cluster-level Forest management committees in Sindhupalchowk should conduct a series of awareness workshops targeting politicians, journalists, and security forces.
- Training on improved harvesting tools is recommended to enhance efficiency and effectiveness. Efforts should be made to simplify the registration process for power chain saw operations. Additionally, transportation of timber from community forests to depots poses a challenge, making it strongly advisable to operate a portable sawmill regularly through coordination between the Cluster-level Forest management committee and the Division Forest Office in Sindhupalchowk.
- To expedite the establishment process, the formation of a joint action team, comprising about thirteen members representing all stakeholders (CFUGs, Private Sector, DoF), is proposed. This team should be supported by an experienced consultant or organization. For post-

establishment operations, it is recommended to hire an experienced individual for a few days each month over the course of one year.

- The municipality also presents significant potential for the pellet industry. Following discussions and a field visit to Janda Devi Nepal Energy Private Limited, they expressed interest in purchasing raw materials for the pellet industry. To facilitate this, the municipality must gather, dry, and compress the raw material. Hence, this opens another promising avenue for initiating a forest-based enterprise.
- As the enterprise need to be expanded with linear programming approach. There are opportunities for treatment of timber to be used for furniture and house construction. To trap the local market, potential client needs awareness/extension activities such as minimizing treatment cost, demonstration, and use of media. So, from the first year, huge extension and promotional activities for diversifying the products will be needed.

Chapter 1

1. Introduction

1.1 General Background

The "Enhancing Livelihoods from Improved Forest Management in Nepal" project (EnLiFT 2) is a forestry research initiative supported by funding from the Australian Government through the Australian Centre for International Agricultural Research (ACIAR). The project aims to reduce gender disparity in decision-making within community forests, create low-labor activities suitable for time-constrained women, establish tree-based businesses on underutilized land, and develop a fresh framework for cooperation between CFUGs and local governments. Moreover, it seeks to formulate models for forest-based businesses that uplift marginalised population, explore alternative regulations for marketing forest products, and address the gap between research and policies for enhancing livelihoods. By implementing these initiatives, EnLiFT 2 strives to enhance the well-being of forest-dependent communities, bolster sustainable forest management practices, and establish a stronger connection between research outcomes and policies to foster positive changes in livelihoods.

EnLiFT's assessment has discerned the viability of establishing a Pine Wood-based Enterprise involving wood seasoning and treatment in Sindhupalchowk. This feasibility study has been undertaken through a collaborative agreement between EnLiFT and Chautara Sangachowkgadi Municipality. This report is structured into five chapters. The introductory chapter encompasses the study's objectives, rationale, and methodology. The second chapter presents the study's findings. Chapter three provides insights into environmental and social considerations, while chapter four delves into pertinent issues. The fifth chapter encapsulates the study's conclusions and outlines recommendations. The report is supplemented with pertinent annexes containing crucial information. Additionally, a concise Business Plan for the proposed enterprise is provided as a separate accompanying document.

1.2 Rational

The AusAID supported projects implemented in the Sindhupalchok district of Nepal since 1978 and concluded in 2006. During the AusAID project time, it supported the establishment of more than 22,000 ha of plantations. The predominant species planted have been *P. patula*, *P. roxburghii* and *P. wallichiana* and a range of broadleaf species. Many of the plantation forests are handed over to and nurtured by Community Forest User Groups (CFUGs). With few exceptions, these community plantations have been conservatively managed, and the emphasis of FUG Operational Plans has largely been on protection and conservation over the last two and half decades. These plantations, nurtured by local communities for over four decades, represent an asset. However, their current state of being overstocked and lacking proactive management necessitates intervention. Despite the communities' long-standing investment in establishment and protection, the actual benefits derived from these forests remain significantly below their potential. The economic value of plantation produces stands as a considerable opportunity, yet it is hindered by

challenges stemming from the decentralized management structure involving numerous community forest user groups. The absence of proficient skills in silviculture, harvesting, institutional setup, marketing, and governance further exacerbates the situation. Addressing this issue through the establishment of a wood seasoning and treatment plant offers a strategic solution. By incorporating value-added processes, the potential benefits can be amplified several-fold. Notably, this approach aligns with sustainable forest management, creating a pathway for these communities to harness the true economic value of their plantations while fostering enhanced skills and capabilities across various aspects of forest management and utilization.

In the context of Sindhupalchok districts, the journey towards sustainable management of plantation and natural forests within community forestry has gained momentum. This progress is underpinned by a comprehensive integrated strategy that leverages the empowering legal framework established through the Forest Act 2019, Forest Regulation 2022, and Sustainable Forest Management Procedure 2022, along with their respective subsidiary regulations and guidelines. This approach encompasses multifaceted components, including the formulation of thinning guidelines aligned with technical management requirements and community preferences. To materialize these strategies, Community Forest User Groups (CFUGs) have undertaken a crucial role by revising their Operation Plans (OPs), which now incorporate tailored thinning prescriptions. These OPs are subsequently endorsed by District Forest Officers (DFOs), cementing a collaborative and regulatory framework. A notable aspect of this landscape is the abundance of potential pine plantation forests in the area, creating a foundation for substantive progress. However, the prevailing scenario reveals that many of these plantations are characterized by dense stocking patterns. While these forests possess the potential to yield timber, their effective management hinges on technical interventions. The establishment of a wood seasoning and treatment plant is pivotal in enhancing the durability of these timber resources, thereby translating the vision of sustainable management into a reality.

1.3 Objective

The general objective of the assignment was to conduct feasibility study for the establishment of wood seasoning and treatment plant in Sindhupalchok. Specific objective of the assignment was,

- Assess the resource availability,
- Identification of potential site for plant,
- Recommend plant operation modality,
- Conduct market survey, and
- Prepare a lay-out of the plant.

1.4 Methodology

The feasibility study for the establishment of a wood seasoning and treatment plant in Sindhupalchok followed a systematic methodology that comprehensively assessed the viability of

the project. The methodology involved a series of interconnected steps designed to gather data, analyze information, and formulate informed recommendations:

- **Preliminary Assessment:**

An initial assessment of the existing pine plantation and natural forest was conducted, evaluating their condition and distribution within the Sindhupalchowk district. This involved reviewing historical records, satellite imagery, and field visits to quantify the extent and health of the plantations as well as natural forests.

- **Resource Availability Evaluation:**

The volume and quality of wood available from 96 CF in Chautara municipality were quantified. This included assessing various tree species, their age, diameter, and overall health. This data formed the foundation for estimating potential timber production.

- **Site Selection and Suitability Analysis:**

Potential sites for the wood seasoning and treatment plant establishment were identified. Factors such as proximity to the plantation forests, accessibility, infrastructure, and environmental considerations were evaluated to ensure the selected site aligned with the project's objectives.

- **Technical and Operational Assessment:**

A comprehensive understanding of the technical requirements for wood seasoning and treatment was developed. This included investigating suitable techniques, machinery, and processes for enhancing the durability and stability of wood products.

- **Market Survey and Demand Analysis:**

A market survey was conducted within the nearby market of Sindhupalchowk district to gauge the demand for wood products, particularly treated and seasoned timber, both locally and regionally. Market trends, pricing, and potential clientele were analyzed to project the economic viability of the venture. Additionally, a detailed financial analysis was prepared, including estimates of capital investment, operational costs, revenue projections, and potential return on investment. A comprehensive business plan was developed, outlining the project's scope, objectives, operational strategies, and financial forecasts.

- **Environmental and Regulatory Assessment:**

The environmental impact of establishing the wood seasoning and treatment plant was evaluated. Compliance with local environmental regulations was ensured, and any necessary permits were obtained.

- **Stakeholder Engagement and Institutional Analysis:**

Relevant stakeholders, including local communities, forest user groups, government agencies, and potential investors, were engaged with them. Their perspectives were understood, insights were gathered, and concerns were addressed to build a collaborative approach.

- **Risk Assessment and Mitigation:**

Potential risks and challenges associated with the project's implementation and operation were identified. Strategies to mitigate these risks were developed, ensuring the project's sustainability and success.

Chapter 2

2. Finding of the study

2.1 Availability of the raw materials

In Chautara Sangachowkgadi Municipality, the total forest area encompasses about 10,443.58 hectares. Within this total area 5,874.55 hectares are attributed to Community Forests (CF), constituting approximately 56.17% of the total forested landscape. Concurrently, an area of 4,569.03 hectares, forming around 43.83% of the total forest area, lies outside the domain of community forest. This external segment encompasses various categories, including leasehold forests, privately-owned forests, and other private lands.

Within this landscape, 28 community forests are distinctly classified as Plantation Forests, dominated by the presence of *Pinus patula* and *Pinus roxburghi*. Alongside, there exist 19 community forests that are Natural Forests that host indigenous varieties of species like Chilaune, katus, sal, utish, and others. Additionally, 49 community forests are Mixed Forests harmoniously combine both plantation and natural forest species, contributing to a nuanced and multifaceted ecosystem mosaic that underscores community stewardship in the municipality. Importantly, a significant proportion of the forest's species comprises softwood varieties, enhancing the municipality's role in fostering sustainable forest management practices with wood seasoning and treatment.

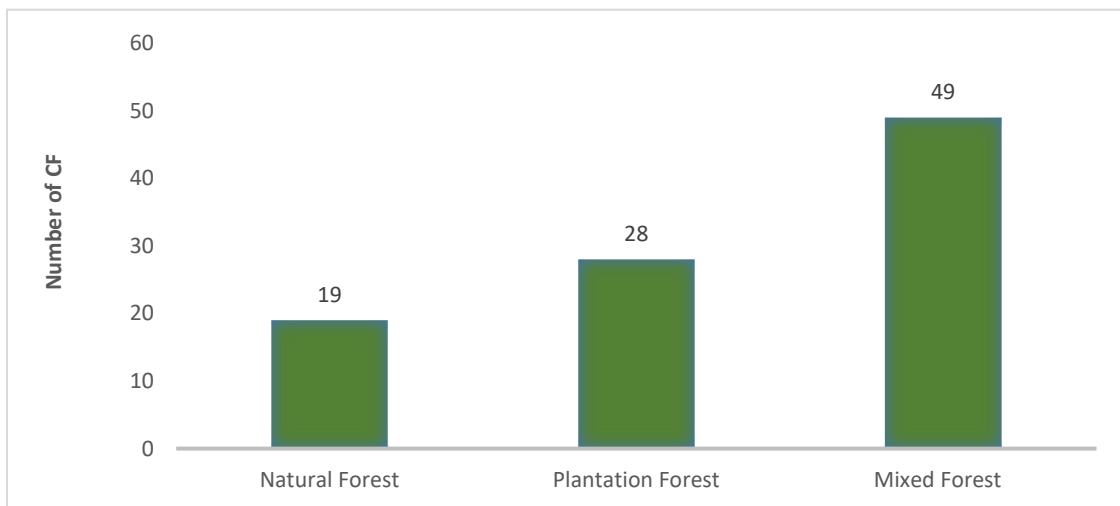


Figure 1: Community Forest Category

In the Chautara Municipality, the community forest holds a total stock of approximately 746,164.10 cubic meters. Under the current Forest Regulation of 2022 and the Sustainable Forest Management Procedure of 2079, an annual timber harvest of approximately 7,461.64 cubic meters is stipulated from within the community forest. Additionally, an annual harvest of approximately 5,677.47 cubic meters of timber is designated from sources outside the community forest.

The community forest in Chautara Municipality comprises a diverse species composition, with Pate Salla accounting for 53% of the total, followed by Gobre Salla at 9%, Utish at 12%, Chilaune at 13%, and the remaining 13% encompassing various other species.

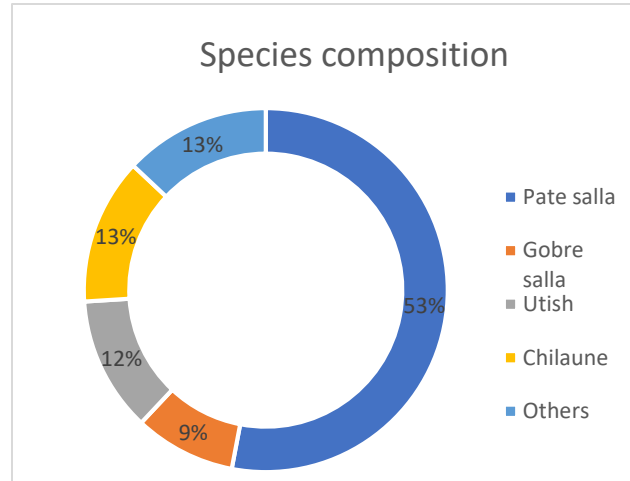


Figure 2: Species composition

Table 1: Annual harvestable amount according to species composition

Sn	Species	Percentage (%)	Annual harvestable amount (m3)
1	<i>Pinus patula</i> (Pate salla)	53	3954.67
2	<i>Pinus spp</i> (Gobre salla)	9	671.55
3	<i>Alnus nepalensis</i> (Utish)	12	895.40
4	<i>Schima wallichii</i> (chilaune)	13	970.01
5	Others	13	970.01
Total		100	7461.64

The above table offers a comprehensive breakdown of the species composition within the community forest situated in Chautara Municipality. This insightful breakdown showcases the distribution of different species in terms of their percentage representation and the corresponding annual harvestable quantities, measured in cubic meters (m³). Pate Salla takes the lead as the most abundant species, encompassing a substantial 53% of the total composition. In accordance with the sustainable forest management procedure, 2079 laid out by the Forest Regulation of, a designated annual harvestable volume of 3954.67 cubic meters is allocated for Pate Salla.

Moving on, Gobre Salla constitutes 9% of the forest's species composition. In terms of harvestable volume, this translates to an annual allocation of 671.55 cubic meters. The species Utish, comprising 12% of the forest's composition, is associated with a harvestable quantity of 895.40 cubic meters annually. Chilaune, contributing 13% to the overall species mix, corresponds to an annual harvestable amount of 970.01 cubic meters. Likewise, the "Others" category, encompassing miscellaneous species, also holds a 13% stake in the composition. A parallel annual harvestable volume of 970.01 cubic meters is designated for the "Others" category. The grand total annual harvestable quantity across all species is precisely 7461.64 cubic meters, harmonizing with the careful and regulated harvesting framework outlined by the present forest management guidelines.

2.2 Availability, Market and Marketing

The market analysis indicates that Kathmandu, Banepa, and Panchkhal are the most promising markets for seasoned and treated wood. A significant discovery during the field visit to Bira Furniture in Kathmandu Valley, established in 1968 AD and recognized as the oldest furniture manufacturer, strengthens this assessment. Bira Furniture is actively engaged in the production and supply of various wooden products, including furniture, door/window frames, trusses, parquets, and wall paneling. Notably, Bira Furniture expressed keen interest in procuring all treated wood from Sindhupalchowk.

This engagement with Bira Furniture underscores a substantial demand and market potential for seasoned and treated wood in the Kathmandu Valley. The establishment's interest in entering into an agreement for the purchase of treated wood further affirms the viability of the market. It is imperative to initiate negotiations and formalize an agreement with Bira Furniture to ensure a strategic partnership and a consistent market outlet.

Furthermore, discussions with various other furniture businesses in the Kathmandu Valley revealed a consistent interest in the treated wood product. Additionally, the strategic location of Sindhupalchowk District, near the China border, presents a significant opportunity for expanding the market reach of seasoned and treated wood. The field visit and market analysis revealed a substantial scope for penetrating the Chinese market. The geographical proximity facilitates efficient transportation and trade, making it feasible to tap into the demand for high-quality wood products in China. This widespread interest and possibilities indicate a robust market demand, suggesting that, with sufficient production from the treatment plant, there is a favorable market environment. The positive response from multiple furniture businesses adds to the confidence that the market is receptive to the seasoned and treated wood produced in Sindhupalchowk district.

2.3 Technical Details of the Plant

Several wood treatment methods are available, and the choice depends on factors such as expected durability of use, and associated costs. The primary objective of our enterprise is to chemically treat pine wood, making it suitable for durable timber applications. Nepal Ban Nigam has already established a treatment plant in Chitwan, operational for several years. Initially, the plant treated Sal, pine, and other wood species. Similar treatment facilities are operational in Hetauda Industrial State and various parts of Terai, focusing on timber treatments.

- Treatment Process:

The optimal treatment method for pine timber involves a pressure treatment process. Open-air seasoned poles, with a moisture content of 20%, are placed into a chamber. Utilizing vacuum pressure, the chamber extracts residual moisture and resins over a 30-minute period. Subsequently, a preservative is introduced into the wood through a pressure machine, requiring an additional hour. Once penetration is accomplished, the poles remain in the chamber for 10-15 minutes to facilitate the precipitation of the preservative, which can be reused for subsequent treatments. Following the completion of treatment, the treated poles are stacked in a shed for a minimum of 48 hours before being dispatched.

- Size and Specification of the Machine:

A comprehensive treatment machine consists of several units, including nearly five feet and 30 feet long cylinders, a vacuum pump, compressor, 7 Hp electric motor (5.25 Kilowatt), preservative mixing tank, and vacuum tank.

- Capacity (Minimum, Maximum, Functions):

Drawing from the experience of the existing plant and consultations with machine suppliers, a single treatment slot requires approximately two hours. In a year, the plant can treat around 3400 cubic feet of timber. Beyond timber treatment, there is potential for treating wood for furniture and construction purposes. Discussions with local communities reveal that untreated house construction materials typically last less than ten years, but treated materials can endure for the entire lifespan of a house. Hence, creating public access to treatment could open a market. Similarly, the furniture industry represents another significant market opportunity.

- Power Requirements:

The treatment plant is equipped with a 7 Hp motor, consuming 5.25 kilowatts of energy. Additionally, the plant requires electricity for logistical purposes. If the scope of the plant is expanded, a total of 10 kilowatts of electricity will be needed.

- Water Requirements:

Water is essential for two purposes: approximately 2,500 liters for preservative preparation and an additional 500 liters for general utilities. Therefore, a daily requirement of at least 3,000 liters of water is necessary.

- **Chemical Requirement:**

Various chemicals are employed for wood treatment based on specific requirements, availability, and affordability. Examples include Creosote Wood treatment, Chromated Copper Arsenate (CCA) pressure treatment, and Pentachlorophenol pressure treatments. In Nepal, CCA is widely used for pole treatment. While recommended for furniture and construction materials, precautions are necessary. Alternatively, Creosote can be used.

- **Structural Requirements and Plan:**

The structural design is a pivotal aspect of construction, necessitating both closed and open sheds for various purposes. Three open sheds are essential: one for piling, debarking, and seasoning of fresh logs; the second for piling well-seasoned, debarked poles ready for treatment; and the third for storing treated poles for at least 48 hours. Additionally, an open shed is required to cover the trolley. The construction plan includes a closed, well-ventilated shed for machine installation and handling, an office building, a store, toilets, and a guardhouse. Adequate space is needed for manoeuvring large lorries during loading and unloading of poles. Considering all these requirements, a minimum of 10 Ropani land is essential.

- **Waste Disposal:**

Waste disposal from the plant is minimized as the precipitated preservative can be reused in the treatment process. Nonetheless, a small, closed tank can be constructed for the disposal of all waste chemicals. Bark from logs can be collected and supplied for pellet manufacturing also another opportunity as a brick factory, with future considerations for preparing bricks for energy.

- **Human Resource Requirement:**

For the plant to operate at a minimum scale (i.e., 8 hours a day), the following personnel are required: an Office Manager, Technician/Supervisor, Truck Driver, Account and Admin personnel, Guards, and Laborers. All labourers and technicians should undergo training in machine handling and the treatment process. Local hiring is recommended, with necessary training provided.

2.4 Legal and Policy Consideration

The following are the major policy that support the establishment and implementation of the wood seasoning and treatment plant in Bagmati province.

Table 2 Provisions related to timber business.

Sn	Policies	Provisions related to timber business	Implications
1	Forest act 2019	<p>A license is required for the utilization, removal, sale, and distribution of timber from Government-Managed forests. The price of the product is prescribed by the Government. Government-managed forests allow the felling of the dead, dying, and diseased trees but not the green trees.</p> <p>Any part of national forest can be handed over to user groups to conserve, use and manage the forest and sell and distribute the forest products independently by fixing their price according to the work plan (Chapter 5, article 25).</p> <p>This Act has introduced a provision of partnership forests in partnership between DFO, local levels and forest users (Chapter 6, Article 23). The forest products from partnership forest should be used internally and only the remaining products should be sold outside of the group (Chapter 6, Article 25).</p> <p>The collection and transportation of forest products from private forests or private cultivation for commercial purpose will require an approval of local government (Chapter 10, article 36).</p>	<p>The Act favors community to manage the forest and engage in the timber business independently.</p> <p>It focuses on the internal use of forest products rather than their trade.</p>
2	Forest regulation 2022	<p>Forest products shall not be collected, sold, or distributed exceeding the quantity specified in the work plan for a whole year. When forest products are likely to damage and get destroyed due to natural calamities, the limitation of quantity will not be considered for collection, sale, and distribution (Chapter 2, article 6).</p> <p>Government may issue a ban on collection use, sale, distribution, and transportation for any specified category of Forest products (Chapter 2, article 12)</p> <p>Timber may be collected out of forest during the period between October 17 to June 14 (8 months) (chapter 2, article 16).</p> <p>CFUGs can collect, sell, and distribute only those forest products mentioned in work plan and after collection, CFUGs must arrange for reforestation or rehabilitation as soon as possible. The sale rate of forest products should be informed to DFO. CFUG can run a forest-based industry outside forest by obtaining approval from concerned agency (Chapter 4, article 32).</p>	<p>It creates a prospect to engage in forest-based business along with managing overuse of forest products for commercial purpose.</p>

		<p>If a private forest wants to use timber for its own purposes, notifying DFO in writing at least before 24 hours along with recommendation from VDC or municipality is necessary. The same process is for registered private forest while transporting forest products. An unregistered forest owner should submit application to DFO before cutting trees from private land (Chapter 7, article 62).</p>	
3	Forest regulation 2022	<p>Article 25 highlights the provision of auction process for timber sale from government managed forests and the royalty rate of different species (listed in Annex 6). Only the registered forest-based industry which is also listed at DFO can compete in auction but in case of hilly district, local sawmill can also compete. The buyer can sell log only after sawing or one level of processing (Article 27). CFUG should harvest timber based on AAH mentioned in operational plan (Article 48, Sub article 3). CFUG needs approval from DFO even for internal use (Article 48, Sub article 4). CFUG are allowed to cut more than AAH if they must distribute to the user that suffered from natural hazards or other hazards (Article 48, sub article 5). If the timber amount crosses the limit of AAH during collection of naturally fallen trees, the AAH should be compromised with next year AAH (Article 48, sub article 6). CFUG can hire firm/company to extract timber from the forest, but those firms will not be valid for auction process (Article 48, sub article 11).</p> <p>Article 49 prioritizes the internal use of timber and the sell/trade of remaining wood only. During internal use, the poor, marginalized, women should be given priority. Similarly, it also includes the provision of the supply of wood to enterprise managed by CFUG at the royalty rate fixed by government.</p> <p>CFUG can establish forest-based enterprise alone or with cooperation of other CFUGs outside community forest (Article 51).</p> <p>The local government should list all private forests and help DFO in the identification and registration process (Article 81). To transport timber within the same local level, a permission from local government is needed whereas to transport timber from one local level to another local level, permission from DFO is required (Article 81).</p> <p>To list the forest-based industry at DFO, forest-based industry needs a recommendation from the subdivision forest office and FENFIT along with industry registration document (Article 128).</p>	
3	Forest Product Auction	<p>Article 7 describes the auction process of different forest products.</p>	<p>The auction process is lengthy. Also, it</p>

	<p>Procedure Directives 2003</p>	<p>The auction should be announced for 15 days if forest product is of NPR 1 lakh and for 21 days if forest product is worth more than NPR 1 lakh (Article 9). The firm or company should have valid registration, PAN, and tax clearance for competing in auction (Article 10) At least two applications for bidding should be received to open the auction, otherwise it should be renounced for next 15 days (Article 16). The auction should be based on the minimum selling royalty rate maintained by the government (Article 20). The winning bidder should transport timber within 3 days of receiving the permit for transportation (Article 26).</p>	<p>can be lengthier if at least two bids are not received during auction. During this the softwood species from hilly region may be damaged and decayed causing a loss to the buyer.</p>
<p>4</p>	<p>Directives for collection and sale of timber/fuelwood from community forests, 2014</p>	<p>Forest User Groups should complete timber harvesting and hauling, between the period of October 17 to 28 May of each fiscal year. But transporting them to the depot can go till the end of 14 June (Chapter 2, article 4). Timber should not be harvested near water source, riverbank, erosion prone areas, Chure areas, slopy areas, and biodiversity hotspot (Chapter 2, article 7). 4D trees should be given priority while harvesting timber and fuelwood from CFUG (Chapter 2, article 8). While harvesting, at least 25 mother trees for single species forest and 5-10 mother trees for mixed species forest should be left (Chapter 2, article 8). Chapter 5 of this directive deals with the sale of timber and fuelwood outside forest user groups. It has laid five points procedures for such sale. Forest user groups must follow the bidding process if they have to sell for commercial purposes. Article 33 provides an auction procedure that the CFUG must follow. The procedure consists of 10 important rules with several annexes to follow and appears to be complicated for the forest user groups to follow. 15 days' notice shall be published in a national daily newspaper if the valuation of forest products is less than NPR 1 lakh and if it is more than NPR 1 lakh notice of 21 days should be announced. At least 3 quotations must be received to carry out the auction process otherwise the notice will be re-announced for a second time.</p>	<p>The directive addresses the environmental and ecological risks as well as the maintenance of forest health associated with timber harvesting. The CFUG timber selling process is very lengthy and requires a high level of regulatory tasks. During this time the quality of timber may deteriorate which can result in the economic loss to timber trader.</p>
<p>5</p>	<p>National Forest Policy 2019</p>	<p>Forest policy aims to be self-reliant on forest products and promote their export with value addition.</p>	<p>The policy facilitates the investment of different sectors in the timber economy.</p>

		<p>For sustainable and effective forest product harvesting, the development and use of innovation and technology are encouraged by the forest policy.</p> <p>The investment of private, community and government sectors in forest-based industries will be encouraged. Timber productivity will be increased through zoning and species selection based on climatic distribution, and productivity analysis.</p>	<p>The policy includes the strategies to increase timber production by encouraging several forestry practices by supporting practitioners.</p>
6	Forest sector strategy 2016-2025	<p>Milestone by 2025: 1 million m3 of timber will be commercially supplied to the domestic market annually and imports will be reduced to zero through additional supply.</p> <p>Action: The present royalty system on timber will be reviewed and revised based on market prices for timber and international best practice.</p> <p>Further the strategy envisions to identify investment opportunities for private sector partnerships with CFUGs to enhance sustainable and productive forest management, and marketing and processing of forest products, especially timber.</p> <p>The strategy also plans to conduct awareness campaigns amongst the public and timber enterprises to create a better understanding and demand for legitimately sourced forest products.</p>	<p>It promotes the domestic timber use by reviewing timber price, encouraging private investment, and forest-based enterprises thereby creating an opportunity for local enterprises to flourish in timber business.</p>
7	Circular-MFSC, March 2012	<p>The growing stock volume of the forest should not exceed 178 m3 per ha while assessing AAH. The harvesting is limited to nearly 1% of growing stock volume (assuming 178 m3 per ha)</p>	
8	Community Forestry Economic Directive, 2017	<p>Chapter 2, Article 5 directs all CFUGs to get Permanent Account Number (PAN) from Internal Revenue Department.</p> <p>Chapter 11 highlights the process for timber sale from CFUG and associated transparency and accountability. Chapter 13 provisions the yearly audit for every CFUG however Chapter 15 Article 60 obligates audit only for the CFUG which have yearly income more than NPR 50000.</p>	<p>It helps to maintain transparency and accountability within CFUGs but an obligation of PAN for every CFUG doesn't seem relevant.</p>
9	Sustainable forest management procedure, 2079		<p>Support for both forest management and operation of forest-based enterprises</p>

2.5 Institutional Modality and Management

After discussions with officials from Chautara Municipality Government, Division Forest Office, relevant NGOs, and conducting a comprehensive analysis of various forest-based enterprises, the Public-Private Partnership (PPP) model emerged as the most suitable choice. This conclusion was drawn considering factors such as enhanced capital infusion, specialized expertise, efficient management practices, risk-sharing mechanisms, innovation potential, scalability, and the robust regulatory oversight that PPP arrangements offer, making it a superior option compared to the cooperative model, leasehold model, and Community Forest User Groups (CFUGs) model.

Public-Private Partnership Model

Public-Private Partnerships have emerged as a strategic framework for addressing infrastructure and service delivery challenges by harnessing the strengths of both the public and private sectors. In the context of the wood seasoning and treatment plant business, the PPP model offers a dynamic avenue for the establishment and operation of modern facilities that enhance the quality and value of wood products. This collaborative approach involves a synergy between government entities and private companies, leveraging their respective resources, expertise, and capabilities.

In this partnership, the government contributes its regulatory oversight, land assets, and potentially financial incentives, while the private sector brings forth investment, technical know-how, operational efficiency, and innovative approaches. This shared responsibility facilitates the creation of wood seasoning and treatment plants equipped with cutting-edge technologies, sustainable practices, and adherence to quality standards. Private partners often excel in introducing innovations that lead to optimized wood processing techniques, energy efficiency, waste reduction, and environmental sustainability. These contributions translate into enhanced product quality, extended durability, and reduced environmental impact, thus positioning the wood industry to thrive in competitive markets.

The PPP model ensures that risks and rewards are shared, aligning the interests of both sectors. Private companies invest in the establishment and operation of the wood seasoning and treatment plant, reducing the financial burden on governments and freeing up public funds for other essential projects. Moreover, PPPs often expedite project implementation due to the private sector's agility and efficiency in decision-making and resource allocation. This collaboration also nurtures local economic growth through job creation, skills development, and the stimulation of ancillary industries, contributing to overall socio-economic development.

Management

Under the chosen Public-Private Partnership (PPP) model, the management of the wood seasoning and treatment plant will be characterized by a collaborative and professional approach, ensuring optimal operational efficiency and sustainable growth. The involvement of both government and private entities brings together their respective strengths to create a well-rounded management strategy.

- Professional Expertise and Efficient Operations:

Private partners, equipped with specialized expertise in wood treatment and industrial operations, will assume a central role in managing day-to-day activities. Their professional management practices will contribute to streamlining processes, optimizing resource allocation, and maintaining consistent product quality. This level of operational efficiency is crucial for meeting the demands of the market while ensuring profitability.

- Public Oversight and Regulatory Compliance:

The public/government sector's involvement ensures robust regulatory oversight and adherence to environmental and safety standards. Regulatory authorities, in coordination with the PPP partners, will monitor the plant's activities to ensure compliance with legal requirements and minimize any potential negative impacts on the environment or the community. This public oversight guarantees responsible and ethical operations.

- Collaboration in Decision-making:

The PPP model encourages a collaborative approach to decision-making. Both public and private partners will engage in regular consultations and joint discussions to determine operational strategies, investment decisions, and pricing mechanisms. This collaborative framework ensures that the plant's activities align with the community's needs and preferences while also meeting business objectives.

- Technological Innovation and Scalability:

Private partners, with their access to advanced technologies and innovative practices, will drive technological innovation within the plant. This might involve adopting state-of-the-art wood treatment techniques, energy-efficient processes, and other industry advancements. The private sector's innovative contributions can significantly enhance the quality of treated wood products, further boosting the plant's market competitiveness.

- Financial Responsibility and Risk Sharing:

In terms of financial management, Chautara municipality will be responsible for 50 % of both capital investments and operational expenses. While for another 50 % of capital investment, operational expenses, and generating revenue through the provision of treatment services, the private sector is responsible. This financial responsibility ensures a high level of accountability and efficiency in resource allocation. Additionally, the risk-sharing mechanism inherent in the PPP model protects the public sector from unforeseen challenges that might arise during operations.

- Community Engagement and Transparency:

Throughout the management process, maintaining open lines of communication with the local community is paramount. Regular updates, community consultations, and transparent reporting mechanisms will foster trust and engagement. This inclusivity ensures that the plant's activities align with the needs and aspirations of the community it serves.

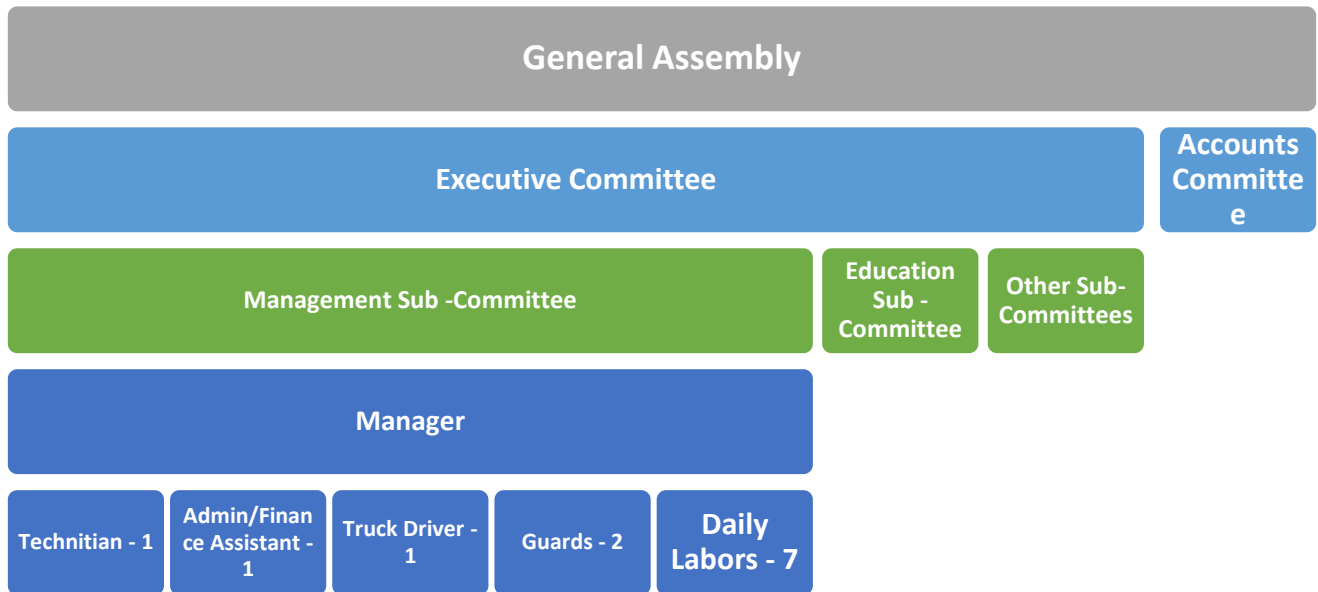


Figure 3 : Organization structure

2.6 Details of the Potential Site for the Plant

The selection of a site for establishing the proposed treatment plant is a pivotal decision crucial for ensuring the sustainable operation of the facility. Numerous factors have been considered to identify potential areas during the consultation process for site selection. The multiple criteria outlined below were developed and thoroughly discussed:

- **Availability and Affordability of Land:**
Anticipating future business expansion, it is estimated that approximately 8-10 Ropani of nearly flat land will be required for the plant.
- **Availability of Electricity:**
The treatment plant, as detailed earlier, requires a 7 Hp motor (approximately 5.25 kilowatts) with a three-phase transmission line. Future business growth may increase the power demand substantially, reaching up to 10 kilowatts.
- **Availability of Water:**
Operating the machine at an average scale necessitates a daily water supply of at least 2,500 litres for treatment. An additional 500 litres are required for staff-related purposes.
- **Accessibility:**
Observation and consultations suggest that potential sites should be accessible for large lorries, requiring a minimum eight-meter-wide road. The road should be all-weather and close to the

highway to minimize reverse transportation costs. The site should also be strategically located towards potential market areas.

- **Security:**

Given the significant investment and transactions involved, security is paramount. The chosen site should offer a high level of security for machinery, equipment, poles, office facilities, and personnel. Proximity to a police station is desirable.

- **Availability of Facilities for Workers:**

Facilities in the vicinity contribute to the well-being and motivation of staff and workers. Factors such as telephone access, easy market access for daily needs, proximity to banks, and access to public transportation are crucial considerations.

- **Interest and Support from Local Communities:**

Positive support from the local community is essential for success. A favourable attitude reduces the risk of insecurity and fosters a welcoming environment for staff and workers.

Initially, three sites (Sukute, Dolalghat, and Jalkuni) were proposed by representatives of Community Forest User Groups (CFUGs) and local government. Sukute was excluded due to high reverse transportation costs. Ultimately, two sites, Dolalghat (Bandeo) and Jalkuni, were selected for detailed analysis based on the outlined criteria. The descriptions of each site are provided below.

Table 3: Description of potential sites against the criteria

Criteria	Dolalghat (Bandeo)	Jalkuni
Availability affordability of land	Open, flat and sufficient (8-10 Ropani) private land is not available.	A substantial, level terrain is accessible within the Sansari Danda Community Forest, and there is enthusiasm for establishing the plant in this location.
Availability of Electricity	Three phase electricity line available in proposed site.	Three phase line available in most of the area.
Availability of Water	Difficult to get required amount. Lifting from Sunkoshi River is feasible but involves huge cost.	Public drinking water supply project being implemented. Underground water is also possible.
Accessibility	Good accessibility but far from the major Community Forest.	Good accessibility and near by most of the active community forest.
Security	No problem	No problem
Availability of facilities for workers	Reasonable facilities available in nearby Dolalghat market	Good market and other facilities.
Interest and Support from Local Communities	The area is less populated. Local people are happy to have processing plant.	Local people are happy to have processing plant and willing to engage.

Source: Field Survey 2080

As there is a scope of expanding the business, it cannot be suggested to compromise the area for the plant. Based on the available information and interaction with stakeholders, Jalkuni will be the suitable site for the plant.

2.7 Financial Aspects

a. Establishment Cost

The primary establishment expenses for the proposed treatment plant encompass various aspects, including the acquisition and installation of the main processing machinery, ensuring adequate water supply, provisioning a reliable three-phase power supply along with a backup system (generator), construction of the plant building, procurement of essential vehicles (truck and motorbike), acquisition of office furniture, and the necessary expenditures for registration, among others. In the event that sufficient funds are available, it is advisable to consider land acquisition as well. Presented below are the preliminary estimated costs for the establishment phase.

Table 4 Establishment cost

S.N	Particular	Amount
1	Land purchase	10000000
2	Main Machine Purchase and Installation	10,000,000
3	Other Cost (Water Supply System, Electricity, Generator)	1,500,000
4	Building Construction	3,000,000
5	Office Set Up	200,000
6	Vehicle Purchase (Truck)	3,000,000
6	Vehicle Purchase (Motor Bike)	300,000
7	Other Cost (Registration etc)	200,000
	Total Establishment Cost	28,200,000

b. Operating Cost

Operating costs can be described as the expenses which are related to the operation of a business (the treatment plant). The costs include expenditures for staff salary, raw material purchase, office utilities, marketing and promotional cost, insurance, machine accessories, training and capacity building and depreciation of machineries. The total operating cost for the 1st year is estimated at Rs. 18096000. Out of the total operating cost, the huge chunk of money (Rs 12540000) will be spent for purchase of raw materials. With Rs. 2956000, staff salary stands at second position. Similarly, depreciation on fixed capital (Rs. 1,820,000) stands at the third position.

The following are the tentative estimation of operating cost for the proposed treatment plant.

Table 5 Operation cost

S.N	Particular	Unit	Quantity	Rate	Amount
	Operational Cost				18096000
1	Salary				2956000
1.1	Manager	Month	13	35000	455000
1.2	Technician	Month	13	30000	390000
1.3	Admin/Finance Assistant	Month	13	28000	364000
1.4	Truck Driver	Month	13	25000	325000
1.5	Security Guard	Month	13	18000	234000
1.6	Labours(7 persons)	Day	1680	600	1008000
1.7	Expert support	Day	60	3000	180000
2	Raw materials purchase				12540000
2.1	Timber	cft	33600	150	5040000
2.2	Chemical	kg	30000	250	7500000
3	Office utilities	Month	12	30000	360000
4	Marketing and Promotional Expenses	Month	12	10000	120000
5	Insurance	Year	1	100000	100000
6	Machine Accessories	LS	1	50000	50000
7	Training and Capacity Building	Ls	1	100000	100000
8	Miscellaneous	LS	1	50000	50000
9	Depreciation on Fixed Capital (Except Land) - 10%				1820000

Sometimes the operating cost is termed as ongoing expenses. It can be divided into two major costs, i.e. fixed and variable costs. As mentioned in the table above, the expenses on purchase of pine timbers and chemical are variable costs. The costs of these two items depend on the scale of production/processing of the plant. The variable cost increases when the plant operates with its full capacity and decreases when it is underused. The remaining costs of the table are fixed costs. In addition, all items mentioned under establishment cost are fixed cost and they are one time cost as well.

c. Capital

The total capital investment is estimated at Rs. 28,000,000. Purchase of land required to set up plant will be a major investment. An amount of Rs. 10,000,000 is allocated for the purpose. Main machine purchase and installation will be the second major investment. Expenses on vehicle purchase will be the third largest amount of capital investment and building construction will be the fourth one. Similarly, provision of water supply system, electricity and generator, purchase of office furniture and equipment's will be other investment of the plant. The following will be the major capital investment.

Table 6 Capital investment

S.N	Particular	Amount
1	Land purchase	10000000
2	Main Machine Purchase and Installation	10,000,000
3	Other Cost (Water Supply System, Electricity, Generator)	1,500,000
4	Building Construction	3,000,000
5	Office Set Up	200,000
6	Vehicle Purchase (Truck)	3,000,000
6	Vehicle Purchase (Motor Bike)	300,000
	Total Establishment Cost	28,000,000

Apparently, Chautara sangachowk municipality has put aside some money to support in establishment of timber processing plant in Sindhupalchok. Therefore, 50 % support for the plant is expected from the municipality. Thus, the estimated capital will be generated from both municipality and private sector.

d. Income

It is estimated that the proposed seasoning and treatment plant will make nearly Rs. 20320000 incomes in the first year. The major income source for the proposed treatment plant will be from selling of processed pine timer. Some 33600 cft timber are planned to buy for the plant so that it can sell them and will have full selling price as its income. The income from such timber will at Rs. 19320000 annually. Addition, price appreciation from the purchased land also is counted as income of the cooperative. Annual 10% price increment is expected on land. Please see the *Table* for details of income sources.

Table 7 Income sources

S.N	Particular	Unit	Quantity	Rate	Amount
	Income				20320000
1	Income from timber selling from both community forest and private land	cft	33600	575	19320000
2	Income from land appreciation (10%)		1	10000000	1000000

e. Profit and Loss

The proposed treatment plant can make profit from very first year of its establishment should it meets all the conditions. Estimated investment amount and full operation of the plant are some of the important conditions which can contribute to realize the plan. Two different profit scenarios are presented in the Table. The total investment means the total capital invested in the plant

whereas actual investment means the amount contributed by the people who will be shareholder of the cooperative and share the benefit of the business. Government subsidy provided to each individual and organizations are not included in the actual investment. The plant will make 8.36% profit on total investment in first year. For the same profit amount, the profit percentage on actual investment will be 14.93%.

Table 8 Profit and loss 1st year.

Particular	Total Investment	Actual Investment
Total Capital Investment	26,600,000	14,900,000
Operational Cost	18,096,000	18,096,000
Income	20,320,000	20,320,000
Profit in Amount	2,224,000	2,224,000
Profit in Percentage	8.36%	14.93%

Chapter 3

3.1 Environmental and Social Consideration

A detailed Initial Environmental Examination (IEE) will have to be conducted. The report will be a separate document. Evidence from other similar plant and sources of resource showed that there will be positive social and environmental impact of the enterprise. A negligible negative effect can be observed especially if the disposal of chemical used but not managed properly. They can be managed with precaution with no negative impact for the local environment. Most of the resources will be extracted based on the scientifically developed thinning regimes; there will be no negative impacts on the forest environment such as erosion, biodiversity, and growth. However, measure will have to be taken while transporting poles out of forests so that there will be minimum damage of plants and soil. Instead of dragging, lifting using pulling machine in sloppy area is recommended. As most of the plantation forest growth has been stagnated, the opening and final felling of the existing tree will increase biodiversity as well as increase forest productivity. The thinning operation will provide massive employment and income opportunities for the community. If the plant is run at a minimum scale, at least Twelve Million Rupees will enter in CFUGs and at least one hundred thousand local person day employments will be generated.

At the plant establishment site, the plant does not need heavy construction. The proposed plant will use mostly wooden poles and beams instead of concrete or metallic one. The off-cuts and bark will be converted into bricked for fuel or will be used in proposed seasoning kiln or sale to brick factory. Though copper chrome arsenic is toxic to human being, they are relatively less harmful than other available chemicals for pole treatment. There will be a minimum waste of CCA as the precipitated preservatives can repeatedly be reused. Small amount of chemical waste will be collected in a deep tank and will be filtered and reused. There will be zero noise pollution during the machine operation. However, lorry will make some noise and air pollution. There are several positive impacts to the local environment such as employment opportunities, opportunities to treat timber for domestic uses, investment opportunities and so on.

3.2 Exploring the wood-based pellet industry.

Consideration of a pellet industry emerges as a viable prospect for the Chautara Sangachowkgadi Municipality. Each year, the region faces the challenge of intense fires in pine forests, resulting in damage to local vegetation and biodiversity. To address this issue, the community has devised a solution—utilizing debris, firewood, or timber to produce pellets. The process begins with the local community gathering forest waste at a designated depot site. Subsequently, a compact machine is employed to compress the raw materials, effectively removing moisture content, and pelletizing this material to final product. To enhance this initiative, the municipality intends to procure machinery, including a dryer to reduce the moisture content of raw materials and a pelletizing/pressurized machine to compact the raw material and produce a final product.

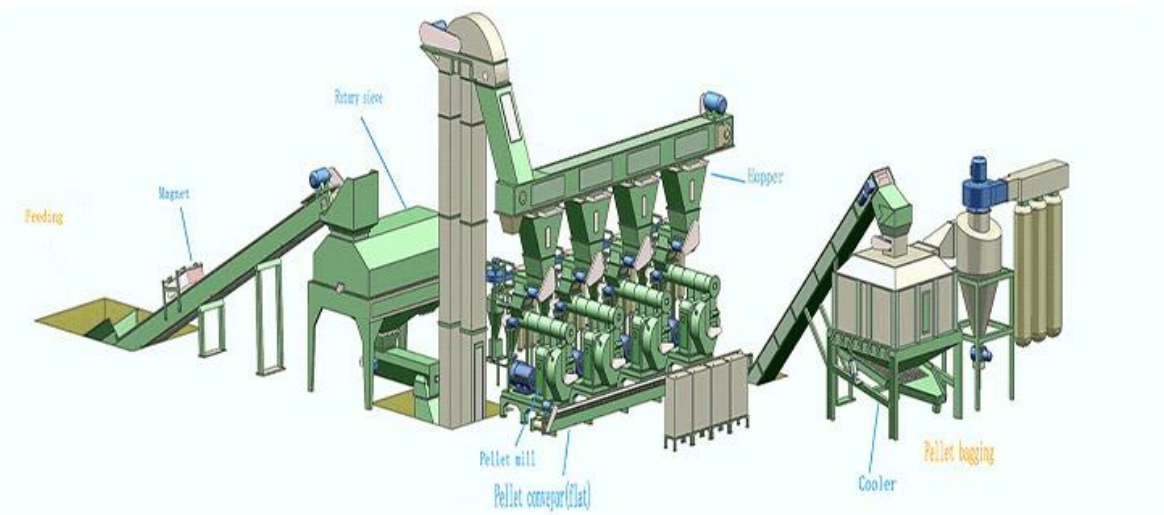
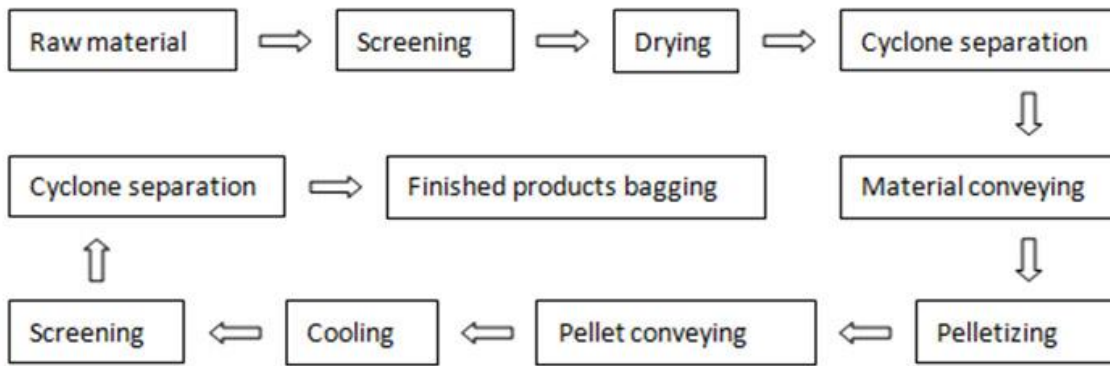


Figure 4: Conceptual overview of a pellet plant from raw material collection to final product

The process for a wood-based pellet plant involves several stages, from raw material preparation to the production of the final wood pellets. Here's a detailed overview of the typical wood pellet manufacturing process:

- **Raw Material Collection:**
The process begins with the collection of raw materials, which typically include wood residues, sawdust, wood chips, and other biomass materials. These materials can be sourced from forestry operations, sawmills, and other wood processing industries.
- **Raw Material Preparation:**
The collected raw materials may undergo initial processing to ensure uniform size and moisture content. Larger wood pieces may be chipped or ground into smaller particles, and the moisture content is often adjusted to an optimal level for pelletization.
- **Drying:**
The prepared raw materials are then sent through a drying process to reduce their moisture content. Lowering the moisture content is crucial for efficient pelletization and ensures the quality and durability of the final pellets.
- **Pelletization:**
The dried raw materials are fed into a pellet mill, where they undergo the pelletization process. This involves compressing the material through the die of the pellet mill under high

pressure. The heat generated during this process softens the lignin in the wood, acting as a natural binder to form pellets.

- **Cooling:**
The newly formed wood pellets are hot and need to be cooled to room temperature to ensure their structural integrity. This is typically achieved using a pellet cooler, which allows the pellets to cool down and harden.
- **Screening and Sieving:**
After cooling, the pellets may undergo screening and sieving processes to remove any fines or undersized particles. This helps ensure that the final product meets quality standards and has consistent size and shape.
- **Pellet Quality Control:**
Quality control measures are implemented to check the density, moisture content, and overall quality of the pellets. Pellets that do not meet the specified standards may be recycled back into the pellet mill for further processing.
- **Packaging and Storage:**
The final wood pellets are then ready for packaging. They can be bagged or stored in bulk depending on the intended market. Proper packaging is crucial to maintain pellet quality during transportation and storage.
- **Distribution and Sale:**
The packaged or bulk wood pellets are distributed to various markets, including residential heating, industrial use, or power generation. Wood pellets are a versatile fuel source used in pellet stoves, pellet boilers, and biomass power plants.

Chapter 4

4.1 Issue and discussion

4.1.1 Sustainability of Raw Material Supply

The optimal quantity of timber anticipated for extraction must align with principles of sustainability. This can be achieved through the amendment of operational plans within community forest user groups, aligning them with the guidelines outlined in the Sustainable Forest Management Procedure, 2023 of Bagmati province. To ensure the continued well-being of the forest ecosystem, it's crucial to implement these new procedures consistently.

Furthermore, the engagement of District Forest Officers (DFOs) is essential. Their endorsement of forest product utilization is a vital component, alongside fostering effective governance mechanisms within community forests. This multifaceted approach strengthens the framework for the ongoing, systematic extraction of forest products while upholding ecological equilibrium and promoting community-centric management practices.

4.1.2 Technicalities of Harvesting, Logging and Transportation

Most forest are located on sloping terrain, ranging from 10% to 100% gradient. The process of felling and transporting logs from these rugged landscapes presents significant challenges. In contemporary times, a considerable number of individuals possess power chainsaws, which they employ for harvesting purposes. These chainsaw operators have undergone training facilitated by EnLiFT and have been duly registered with the DFO in Sindhupalchowk.

The transportation of logs within such steep terrain proves to be a challenging task. The application of conventional techniques for transportation results in exorbitant costs. As a result, there emerges a pressing need to introduce innovative methods for transporting logs, including the utilization of bulls to drag the logs or the implementation of manually operated pulling machines. Additionally, the prospect of employing portable sawmills within community forests during the harvesting process in challenging locations holds promise.

4.1.3 Capacity building of forest officials and communities

- The EnLiFT project has a crucial role to play in delivering comprehensive capacity-building training sessions to both forest officials and community forest user groups. These training programs should be designed to equip participants with the necessary knowledge and skills. To achieve widespread impact, it's essential that these trained individuals then disseminate the acquired expertise to their respective communities and the lower-tier staff. This dissemination process ensures a broad understanding of sustainable forest management practices.
- Unfortunately, a significant portion of the operational plans adopted by community forests do not align with the guidelines outlined in the Sustainable Forest Management Procedure of 2023. To bridge this gap, the Cluster level forest management committee and local government should take an active role in offering technical support to these communities. This support is integral to enabling them to develop and execute plans that are in line with sustainable forest management practice.

- Although the concept of sustainable forest management is not new to the Sindhupalchowk district, recent changes in leadership within political parties, communities, and the DFO have created an urgency for the practical demonstration of methodologies, tools, and techniques related to sustainable forest management. These demonstrations are essential to secure a consistent and lasting supply of both timber and non-timber forest products.
- As the success of the wood treatment plant also depends on the institutional capacity of the Division Forest offices, all the subdivision should be well equipped for supporting CFUGs in forest management activities. Similarly, there will be critical role of field level forest office for providing monitoring and advisory support to treatment plant. Necessary infrastructure will have required them to facilitate the support. This may include renovation of office, developing computer-based record keeping system etc.

4.1.4 Relation and Coordination with Ministry and other Markets

Within the domestic context, the primary market for treated timber revolves around the cities of Kathmandu, Banepa, and Panchkhal. To ensure a steady demand for treated timber, it becomes imperative for a cohesive effort to be arranged under the guidance of senior officials from the department. Once this framework is firmly established, the cooperative can actively engage in ongoing discussions and collaboratively devise strategies for cultivating a sustainable long-term market.

4.1.5 Management of the Plant:

As there will be representatives of diverse and different interest groups in the cooperative and in Executive Committee, there will be high chance to be influenced and affected by party politics. A thoughtful plan needs to put in place to overcome the potential problem. Therefore, management sub-committee comprising of independent professional, and businessman is strongly recommended.

Chapter 5

5.1 Conclusion

In summary, the feasibility study delved into key facets of the enterprise crucial for the sustainability of the treatment plant. The examination encompassed aspects such as the continuous supply of raw materials, the enduring market for processed products, institutional modalities, adherence to forest policy, and environmental considerations, all of which are pivotal for the treatment plant's sustainability. The investigation anticipates a sustainable supply of pine timber sourced from diverse community forests and private lands. Furthermore, a substantial market potential is identified, particularly in the Kathmandu Valley and across borders, notably in China. The study notes that the prevailing government policies favor environmentally friendly enterprises, reinforcing the positive environmental impact of the proposed treatment plant. Considering the comprehensive analysis of these factors, the study concludes that establishing a wood seasoning and treatment plant in Jalkuni, Sindhupalchowk, utilizing resources from various Community Forests in the district, is feasible. Additionally, the study identifies the pellet industry as a viable alternative, given its substantial market potential and associated opportunities.

The specific recommendations for establishing and sustainable operation of the plant are listed below.

- The Public-Private Partnership (PPP) model emerged as the most suitable option, considering factors such as increased capital infusion, specialized expertise, efficient management practices, risk-sharing mechanisms, innovation potential, scalability, and the robust regulatory oversight inherent in PPP arrangements.
- An experimental policy or regulatory mechanism is essential to establish connections with the markets in Kathmandu Valley and cross-border markets to ensure a stable market for treated timber. Urgent actions include policy reviews and a comprehensive market study for exporting seasoned and treated timber.
- Addressing concerns raised by buyers regarding the quality of treated timber, its strength, and durability is crucial. To provide quality assurance, official certification, such as the Nepal Quality Certification Mark (NS), is recommended. This necessitates further research on treatment, strength, and durability to develop appropriate standards.
- It is essential to highlight the importance of streamlining the OP revision process with the goal of reducing costs, particularly when the OP is under the ownership of the CFUG, and simultaneously meeting local demand. CFUGs require technical support for the revision of their operational plans, emphasizing Sustainable Forest Management procedures outlined in the Bagmati province's 2079 guidelines.
- Community reorientation on forest management and awareness of relevant laws and regulations are necessary for the involved communities. Cluster-level Forest management committees in Sindhupalchowk should conduct a series of awareness workshops targeting politicians, journalists, and security forces.

- Training on improved harvesting tools is recommended to enhance efficiency and effectiveness. Efforts should be made to simplify the registration process for power chain saw operations. Additionally, transportation of timber from community forests to depots poses a challenge, making it strongly advisable to operate a portable sawmill regularly through coordination between the Cluster-level Forest management committee and the Division Forest Office in Sindhupalchowk.
- To expedite the establishment process, the formation of a joint action team, comprising about thirteen members representing all stakeholders (CFUGs, Private Sector, DoF), is proposed. This team should be supported by an experienced consultant or organization. For post-establishment operations, it is recommended to hire an experienced individual for a few days each month over the course of one year.
- The municipality also presents significant potential for the pellet industry. Following discussions and a field visit to Janda Devi Nepal Energy Private Limited, they expressed interest in purchasing raw materials for the pellet industry. To facilitate this, the municipality must gather, dry, and compress the raw material. Hence, this opens another promising avenue for initiating a forest-based enterprise.
- As the enterprise need to be expanded with linear programming approach. There are opportunities for treatment of timber to be used for furniture and house construction. To trap the local market, potential client needs awareness/extension activities such as minimizing treatment cost, demonstration, and use of media. So, from the first year, huge extension and promotional activities for diversifying the products will be needed.

Reference

- Amatya G., Tuladhar P.M. 2010; The Study on Pine Timber Export to Tibet and Pine Electric Pole Treatment Industry,
- Dangal S, Arentz F 2002; A discussion paper on Management Prescription for Pine Plantations in the Nepal-Australia Community Resource Management Project Area.
- DOF. 2004. Community Forest Inventory Guideline; Ministry of Forests and Soil Conservation, Department of Forest (DOF): Kathmandu, Nepal.
- Hunt, S , Dangal S & Shreshta S 2001: The impact of Stocking on the Growth of Pine Plantation in t he Mid Hills District of SP and KP
- Kayastha B, Pradhan S.L, Rasaily N, Dangal S. & Arentz SF, 2002; Community Forest Products Marketing Options for Timber and Non-Timber Forest Products.
- Ministry of Forest and Soil Conservation 2006; Thinning Guideline for *Pinus Patula* and *Pinus roxburghii*
- MoFE 2019. Forest Act 2019. Ministry of Forests and Environment (MoFE), Government of Nepal, Kathmandu.
- MoFE 2022. Forest Regulation 2022. Ministry of Forests and Environment (MoFE), Government of Nepal, Kathmandu.
- Nepal Australia Community Forest and Livelihood Project, 2003; Marketing of Timber Products form Pine Plantation
- NO FRILLS 2099; Report on Identification of Timber Processing and Marketing Options for the Chauttara Ridge Plantation Community Forest.
- Timber Corporation of Nepal 2010; A Report on the Sharing and Interaction Workshop of Treated Pine Pole Production and Marketing.

Annex 1: List of CF and its detail

S. N	CF Name	Area (Ha.)	Total stock	Annual amount (Cum.)	Forest Type	Primary spp. (with approx %)	Forest condition	EC involvement
1	Aaitabare CFUG	42	5218.92	52.19	Natural Forest	Pate Salla, Uttis	Partially Degraded	Partially Active
2	Aambote Singhdevi CFUG	50.13	4261.05	42.61	Mixed Forest	Kattus, Pate Salla, Sal (sparse)	Non Degraded	Partially Active
3	Aasetar Batasey	338.8	42099.28	420.99	Mixed Forest	Salla, Sajh, Sal, Chilaune, Harro, Barro, Jamun	Partially Degraded	Inactive
4	Amale CFUG	42.25	5249.98	52.50	Mixed Forest	Sal, Chilaune, Uttis, Khote Salla	Partially Degraded	Inactive
5	Bajh Bishauni CFUG	78.22	13688.50	136.89	Mixed Forest	Pate Salla, Chilaune, Dhalne, Rhododendron, Uttis	Non Degraded	Fully Active
6	Bajhe Kapash CFUG	60.15	10105.20	101.05	Plantation Forest	Khote Salla, Chilaune and Kattus	Non Degraded	Fully Active
7	Bajho Bari CFUG	0.76	94.43	0.94				Inactive
8	Bandeu Patle CFUG	332	41254.32	412.54	Natural Forest	Sal, Sajh, Chilaune, Salla	Partially Degraded	Inactive
9	Bashuki CFUG	54	6710.04	67.10	Mixed Forest	Salla, Uttis	Partially Degraded	Partially Active
10	Bhagwati CFUG	62	7704.12	77.04	Plantation Forest	Salla, Chilaune	Partially Degraded	Fully Active
11	Bhajan Dada CFUG	4.5	559.17	5.59	Mixed Forest	Uttis, Chilaune, Salla	Fully Degraded	Inactive
12	Bhalu Ban CFUG	62.5	7766.25	77.66	Mixed Forest	Uttis, Chilaune, Salla	Fully Degraded	Inactive
13	Bhaluwan CFUG	63.55	7896.72	78.97	Plantation Forest	Salla, Uttis, Rani salla, Chilaune	Partially Degraded	Partially Active
14	Bhasme Mahabhir CFUG	89	11059.14	110.59	Natural Forest	Sal (sparse), Uttis, Chilaune, Dhalne	Partially Degraded	Partially Active

15	Bhedi Goth CFUG	78.5	9754.41	97.54	Plantation Forest	Sal (sparse), Salla	Partially Degraded	Inactive
16	Bhimsensthan CFUG	2.42	300.70	3.01	Natural Forest			Inactive
17	Bimreni CFUG	34	4828.00	48.28	Mixed Forest	Salla, Sal, Chilaune, Mauwa, Uttis	Partially Degraded	Inactive
18	Bisauni pakha CFUG	21.79	2707.62	27.08	Natural Forest	Uttis, Chilaune	Partially Degraded	Inactive
19	Chakrapal CFUG	39.5	4908.27	49.08	Mixed Forest	Chilaune, Salla, Uttis	Non Degraded	Partially Active
20	Chhap Danda CFUG	38.73	4066.65	40.67	Plantation Forest	Salla, Chilaune	Partially Degraded	Partially Active
21	Chille Ghari CFUG	103	12798.78	127.99	Mixed Forest	Sal (sparse), salla, Chilaune, Katus	Partially Degraded	Inactive
22	Chisapani Sukre CFUG	45.6	5666.25	56.66	Natural Forest	Salla (sparse), chilaune, Uttis, Kattus	Partially Degraded	Inactive
23	Dandur Mane Danda CFUG	35	4349.10	43.49	Plantation Forest	Salla, Chilaune	Partially Degraded	Partially Active
24	Deurali Thulo Chaul Womens CFUG	8.59	1185.42	11.85				Inactive
25	Devisthan chiyandanda CFUG	5.27	654.85	6.55	Natural Forest	Sal (sparse), Pauwa, Chilaune	Partially Degraded	Inactive
26	Dhap Pakha CFUG	4.04	630.24	6.30				Inactive
27	Dhara Pani CF	13	1615.38	16.15	Plantation Forest	Salla, Sal (sparse), Chilaune, Uttis.	Partially Degraded	Partially Active
28	Dhimpuran Thul Danda CFUG	70	8698.20	86.98	Plantation Forest	Salla, Chilaune	Partially Degraded	Inactive
29	Gaurati Chihan Danda CFUG	102.75	12767.71	127.68	Plantation Forest	Salla (Khotte, Thingre, Gobre, Patle, Lod and Rani)	Partially Degraded	Partially Active
30	Gaurikhet CFUG	14	1739.64	17.40	Natural Forest	Chilaune, uttis, Mauwa, Khote Salla	Partially Degraded	Inactive
31	Harlang-Barlang CFUG	28	3479.28	34.79	Natural Forest	Chilaune (majority), Uttils, Salla and Kafal	Fully Degraded	Inactive
32	Harre CFUG	81	10065.06	100.65	Mixed Forest	Sal, Chilaune, Uttis	Fully Degraded	Inactive

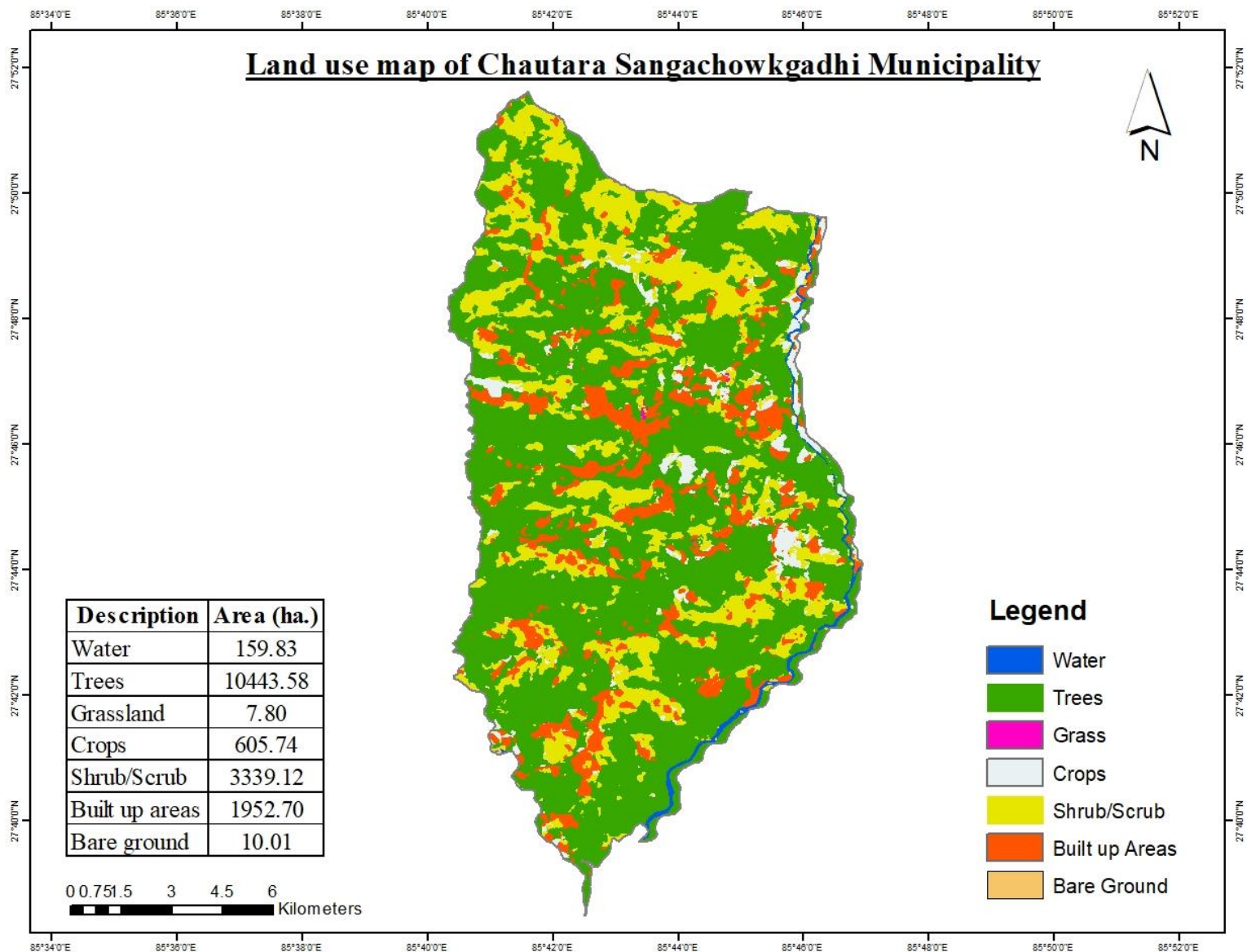
33	Harre Pakha CFUG	64.36	7997.37	79.97	Natural Forest	Sal, Salla, Chilaune	Partially Degraded	Fully Active
34	Hundrung CFUG	72.61	9022.51	90.23	Mixed Forest	Chilaune, Salla, Kattus, Uttis	Partially Degraded	Inactive
35	Jal Devi CFUG	197	24479.22	244.79	Natural Forest	Khote Salla, Uttis, Kafal, Chilaune, Paheli	Partially Degraded	Inactive
36	Jalpa CFUG	63	7828.38	78.28	Plantation Forest	Sal (sparse), Salla, Chilaune	Partially Degraded	Fully Active
37	Jangali Kali Devi CFUG	4.86	603.90	6.04		Uttis, Chilaune		Inactive
38	Jhyadi Maduwa CFUG	145	18017.70	180.18	Plantation Forest	Chilaune, Sal, Salla	Partially Degraded	Partially Active
39	Jhyali Khola CFUG	12.62	1173.66	11.74	Plantation Forest	Salla Sal, Chilaune	Partially Degraded	Partially Active
40	Kafal Botey CFUG	4.12	511.95	5.12	Natural Forest			Inactive
41	Kali Bhagwati CFUG	1.66	206.27	2.06	Mixed Forest	Chilaune, Sal, Angeri, Lakuri	Partially Degraded	Inactive
42	Kali Devi Womens CFUG	8.43	1047.51	10.48	Natural Forest	Sal Forest	Partially Degraded	Partially Active
43	Kalika CFUG	136.46	16956.51	169.57	Mixed Forest			Inactive
44	Kalleri CFUG	47	5840.22	58.40	Plantation Forest	Sallo, Kattus, Uttis, Chilaune	Partially Degraded	Fully Active
45	Kamala Mai CFUG	16.5	2442.00	24.42	Plantation Forest	Khote Salla, Chilaune	Non Degraded	Partially Active
46	Kami Dada CFUG	41.75	5187.85	51.88	Plantation Forest	Chilaune, Salla, Kafal	Partially Degraded	Partially Active
47	Karkitar SattheMure CFUG	185.25	23019.16	230.19	Natural Forest	Salla , Sal	Partially Degraded	Fully Active
48	Khamare RangRing CFUG	151	18763.26	187.63	Mixed Forest	Salla , Sal, Sajh	Partially Degraded	Partially Active
49	Khatri Thok CFUG	141.32	17560.42	175.60	Mixed Forest	Sal, Salla, Chilaune, Sajh	Partially Degraded	Inactive
50	Khole Khoko CFUG	122	15159.72	151.60	Mixed Forest	Sal (90%), Chilaune, Sajh, Mauwa, Dhalne	Partially Degraded	Inactive
51	Koirala Khok CFUG	73	9070.98	90.71	Mixed Forest	Sal, Sajh, Chilaune	Partially Degraded	Inactive
52	Kutunje CFUG	25	3106.50	31.07	Plantation Forest	Salla, Chilaune, Sal (few)	Partially Degraded	Inactive

53	Lampakhey Dadapari CFUG	40	4970.40	49.70	Mixed Forest	Sal, Chilaune (major), Pate salla	Partially Degraded	Inactive
54	Lampate CFUG	78.01	9693.52	96.94	Mixed Forest	Chilaune, Khote Salla	Partially Degraded	Partially Active
55	Lasune Ganeshthan Sisneri CFUG	149	18514.74	185.15	Plantation Forest	Sal ,Khote Salla, Uttis, Chilaune	Partially Degraded	Partially Active
56	Laxmi Womens CFUG	15	1863.9	18.64	Plantation Forest	Chilaune, Sal, Salla	Partially Degraded	Inactive
57	Mahakali CFUG	28	3479.28	34.79	Mixed Forest	Chilaune, Salla, Uttis, Rhododendron	Partially Degraded	Inactive
58	Mahankal CFUG	14	1022	10.22	Natural Forest	Paheli, Uttis, Chilauen, Mauwa, Archale	Partially Degraded	
59	Mahabhir bhasme CFUG	86.24	10716.18	107.16	Mixed Forest	Kattus, Chilaune, Mauwa, Uttis	Partially Degraded	Partially Active
60	Narayan Devi CFUG	8.92	1108.39	11.08				Inactive
61	Nepane CFUG	102.2	12699.37	126.99	Mixed Forest	Chilaune, Sal, Salla	Partially Degraded	Partially Active
62	Okhreni CFUG	122	15159.72	151.60	Mixed Forest	Pate Salla, Uttis, Gobre Salla, Rani Salla	Non Degraded	Fully Active
63	Padheri Danda CFUG	28	3479.28	34.79	Natural Forest	Uttis, Chilaune, Kafal, Rhododendron; Pate Salla	Partially Degraded	Inactive
64	Padheri Khola CFUG	7.48	929.46	9.29		Salla, Sal, Chilaune		
65	Paleko CFUG	6	745.56	7.46	Mixed Forest	Sishao (sparse); Uttis, Chilaune	Partially Degraded	Inactive
66	Paran Danda CFUG	73.37	9116.95	91.17	Natural Forest	Sal Forest	Partially Degraded	Inactive
67	Piple CFUG	78.77	9787.96	97.88		Sal , Chilaune Mauwa		Inactive
68	Ramche CFUG	79.5	9878.67	98.79	Plantation Forest	Salla, Chilaune	Partially Degraded	Inactive
69	Ranibari CFUG	74	12950.00	129.50	Natural Forest	Rhododendron, Kafal, Uttis	Non Degraded	Partially Active
70	Rol Pakha Womens CFUG	80	14080.00	140.80	Plantation Forest	Salla, Sal (sparse), Chilaune	Partially Degraded	Inactive
71	Salleri Ghari Chiuri Bote CFUG	80	9940.80	99.41	Plantation Forest	Sajh, Chilaune Salla	Partially Degraded	Inactive

72	Sansari Danda CFUG	91.68	16960.80	169.61	Natural Forest	Salla, Uttis, Chilaune, Kattus	Non Degraded	Fully Active
73	Sere Danda Panche Danda CFUG	81.88	10174.41	101.74	Natural Forest	Sal, Chilaune, Mauwa, Salla	Partially Degraded	Inactive
74	Shree Chhap Deurali CFUG	78.29	9728.32	97.28	Mixed Forest	Sal (sparse); Salla (dominant), Chhap, Uttis	Non Degraded	Fully Active
75	Siddhi Ganesh CFUG	109	13544.34	135.44	Mixed Forest	Salla, Chilaune, Sal	Partially Degraded	Fully Active
76	Sila Devi CFUG	0.87	108.11	1.08	Plantation Forest			Inactive
77	Sinang Garang CFUG	18.76	2331.12	23.31	Natural Forest	Chilaune, Kattus	Partially Degraded	Inactive
78	Sita Mahadevsthan CFUG	27	3355.02	33.55	Natural Forest	Uttis, Chilaune, Kafal and Rhododendron	Partially Degraded	Inactive
79	Sop Danda gairi CFUG	15	1863.90	18.64	Mixed Forest	Salla, Chilaune, Uttis	Partially Degraded	Inactive
80	Sungure CFUG	124.89	15518.83	155.19	Mixed Forest			Inactive
81	Surkeni CFUG	75.24	9349.32	93.49	Mixed Forest	Uttis, Chilaune	Partially Degraded	Partially Active
82	Tagarey CFUG	77	9568.02	95.68	Plantation Forest	Salla, Sal, Chilaune	Partially Degraded	Inactive
83	Tama Khani CFUG	105.83	8995.55	89.96		Khote salla, Pate salla		Inactive
84	Tare Bhir CFUG	52.43	9384.97	93.85	Mixed Forest	Chilaune, Khote Salla	Non Degraded	Partially Active
85	Thana Pari CFUG		0.00	0.00	Mixed Forest	Sal, Dhaap, Chilaune, Kattus	Partially Degraded	Inactive
86	Thulichaur CFUG	13.19	1638.99	16.39		Uttis, Chilaune		Inactive
87	Tuni Pakha CFUG	5.47	679.70	6.80	Mixed Forest	Chilaune, Uttis, Kattus, Chhap, Sishao (sparse)	Partially Degraded	Inactive
88	Jungali kalika devi	4.86	603.90	6.04		Uttis, Chilaune		
89	Kalobhir Khortak danda	2	248.52	2.49		Chilaune, Khote Salla, Chilaune, Utish		
90	Talkot rani pokharai CFUG	119.8	14886.35	148.86				
91	Dandor CFUG	57.49	7143.71	71.44		Salla, Chilaune, Sal		

92	Deurali chiyani danda CFUG	39.08	4856.08	48.56				
93	Kavre thanapari CFUG	13.06	1622.84	16.23				
94	Aokhreani CFUG	73.75	9164.18	91.64				
95	Gairikhe mahila CFUG	14.25	1770.71	17.71				
96	Satidevi mahila CFUG	5.25	652.37	6.52				

Annex 2: Land use map of Chautara Sangachowkgadi Municipality



Annex 3: Plant construction plan map

