

Timber Harvesting in FMUs & WSs

April 2014



DISCLAIMER NOTE

The audit was conducted in conformity to the RAA's Auditing Standards and Performance Audit Guideline. The audit findings are based on the facts and information made available and accessible to the audit team. All reviews were confined to selected areas specified in the plan document. The audit review does not cover operations outside Forest Management Units (FMUs) and Working Schemes (WSs). The review also does not cover timber disposal and distribution system.

This is also to certify that the auditors during the audit had neither yielded to pressure, nor dispensed any favor or resorted to any unethical means that would be considered as violation of the Royal Audit Authority's Code of Good Conduct, Ethics and Secrecy.





Bhutan Integrity House



Reporting on Economy, Efficiency & Effectiveness in the use of Public Resources

RAA/AG-SP/2014/865

April 1, 2014

The Hon'ble Secretary Ministry of Agriculture & Forests Thimphu

Subject: Environmental Audit Report on Timber Harvesting in FMUs and WSs

Sir,

Enclosed herewith, please find a copy of the **Environmental Audit Report on Timber Harvesting in Forest Management Units (FMUs) and Working Schemes (WSs)**. The study was conducted as mandated under the Constitution of the Kingdom of Bhutan and the Audit Act of Bhutan 2006.

The review focused mainly on the evaluation of plans and determining whether timber harvesting operations conform to practices enabling sustainable harvesting and ecosystem management in FMUs and WSs. The review does not cover operations outside FMUs and WSs. Therefore, the issues on illegal timber felling or harvesting outside FMUs and WSs is not covered in this audit. The audit team visited selected FMUs and WSs and interviewed relevant officials, both management and field staff.

The report highlights both progressive development in forestry management and deficiencies observed in audit. The Royal Audit Authority has noted many commendable achievements in ensuring sustainable utilization of forests and also in addressing the needs in constructions and infrastructures developments in the country. However, only few significant ones directly attributable to the efforts of the Department of Forest & Park Services (DoFPS) and the Natural Resources Development Corporation Limited (NRDCL) are reported under the Part I of the report. Besides, the RAA also observed few shortcomings as briefly highlighted below:

- ⊕ There is a risk of dominant species like blue pine colonizing and disturbing the native species composition. The stock compositions in the FMUs and WSs are mainly of blue pines;
- ⊕ The fir forests face immense threats as most available stocks in the FMUs were matured, diseased or in dying stage requiring appropriate interventions;
- ⊕ Natural regeneration in the broadleaved forests is severally challenged with complex regeneration dynamics and rampant grazing problems in the areas;
- ⊕ FMUs areas which have its functions distinct from the protected areas and Community Forestry have over-lapping boundaries which may give rise to conflicting objectivity and management difficulties;

- \oplus Impact Assessment was not carried out after harvesting operations in the FMUs to study its impact on forest ecosystem;
- ⊕ Understanding on standards, criteria and benchmarks on coupe clearance as required under the Forest Management Plan is generally lacking;
- ⊕ Violations of some of the National Environment Commission Secretariat (NECS) terms and conditions were observed in the field;
- ⊕ Occupational Health and Safety (OHS) measures prescribed by the Ministry of Labour and Human Resources was not adequately enforced in most of the harvesting sites visited by the audit team;
- ⊕ Some of the logging machineries and equipment used by the NRDCL were found as old as twenty years. Use of old heavy machineries and equipment may pose risks to operators and workers in the field.

On the basis of audit findings and comments received, the RAA has formulated specific recommendations to initiate appropriate interventions towards effective management of forest resources.

The RAA has received the response to the draft report shared with the DoFPS and the NRDCL. The responses are incorporated and exhibited as **Appendix I** of this report. The RAA would also appreciate receiving detailed Action Plan based on the audit recommendations **on or before 30th June 2014**.

The RAA acknowledges the cooperation and support extended by the officials of the Department of Forestry & Park Services and the employees of the NRDCL to the audit team which facilitated timely completion of audit.

Yours Sincerely,

(Ugen Chewang) Auditor General

Copy to:

- 1. The Hon'ble Minister, Ministry of Agriculture & Forests, Thimphu;
- 2. The Hon'ble Chairperson, Public Accounts Committee, National Assembly, Thimphu (*enclosed five copies*);
- 3. The Hon'ble Chairperson, Natural Resources & Environment Committee, National Council, Thimphu;
- 4. The Secretary, National Environment Commission Secretariat, Thimphu for necessary action;
- 5. The Director General, Department of Forests & Park Services, MoAF for necessary action.
- 6. The CEO, Natural Resources Development Corporation Ltd., Thimphu for necessary action.

TITLE SHEET

1. Name of Report	: Environmental Audit on the operation and practices of Timber Harvesting in FMUs & WSs
2. AIN	: 002-01-12088
3. Name of Audited Agencies	 i) Natural Resources Development Corporation Limited (NRDCL) ii) Department of Forest & Park Services, Ministry of Agriculture & Forests
4. Schedule of Audit	: 01.11.2012 – 28.02.2013
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ABBREVIATIONS

AAC	:	Annual Allowable Cut
BLC	:	Bhutan Logging Corporation
CF		Community Forest
CFO	:	Chief Forestry Officer
DHI	:	Druk Holding and Investments
DoFPS	:	Department of Forest and Park Services
FDCL	:	Forestry Development Corporation Limited
FMP	:	Forestry Management Plans
FMU	:	Forest Management Unit
FRDD	:	Forest Resources Development Division
FRMD	:	Forest Resources Management Division
GIS	:	Geographical Information System
GPS	:	Global Positioning System
NEC	:	National Environment Commission
NRDCL	:	Natural Resources Development Corporation Limited
OHS	:	Occupational Health and Safety
ОР	:	Operational Plan
RAA	:	Royal Audit Authority
RNR-RC	:	Renewable Natural Resources – Research Centre
SOP	:	Standard Operating Procedures
WS	:	Working Scheme

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1. EXECUTIVE SUMMARY

BACKGROUND

What

FOUND?

RAA

Environmental Audit on the operations and practices of Timber Harvesting in FMUs and WSs

Article 25.1 of the Constitution of Kingdom of Bhutan and Section 3 of the Audit Act of Bhutan 2006 state that *"There shall be a Royal Audit Authority to audit and report on the economy, efficiency and effectiveness in*

the use of public resources". In line with this important constitutional responsibility, the RAA is required to examine whether the Government agencies are doing the right things in the right and least expensive way. In doing so, the RAA not only looks at *"what has been done"*, but also *"what has not been done"* to achieve the ultimate objective.

Government organizations and private individuals have become increasingly dependent on timber for constructions and infrastructure development. Therefore, the pressure on sustainable utilization of forests has been growing over the years.

On the other hand, the Kingdom of Bhutan has always placed its environmental conservation efforts ahead of all socio-economic developments. The importance of such efforts are well resounded through numerous national policy. According to the Constitution of the Kingdom of Bhutan, 60% of the total land area of the country should be reserved as forest cover for all times to come.

Accordingly, the Department of Forest & Park Services (DoFPS) under the Ministry of Agriculture & Forests also gears its efforts towards sustainable utilization of forests. Scientific management of forests is done through identification and establishment of Forest Management Units (FMUs) and managing them under a prescription of written management plans prepared by the DoFPS and implemented by the Natural Resources Development Corporation (NRDCL).

As mandated under the Constitution of the Kingdom of Bhutan, the RAA planned to examine whether the timber harvesting operations practices sustainable and scientific management of forests and the practices embrace policy objectives of environmental conservations. It is in this respect that the Royal Audit Authority took up the environmental audit of timber harvesting with following audit objectives:

- ⊕ To evaluate the effectiveness of plans and regulations in sustaining the forest resources in FMUs and Working Schemes (WSs); and
- \oplus To determine whether the timber harvesting operation is undertaken in a sustainable manner, giving due consideration to the environment and ecosystem.

Forests represent complex ecological processes with a potential to provide human needs and environmental values. Recognizing the potential value of its forestry resources, Bhutan became increasingly conscientious about forestry management. The silvicultural

management concept was realized and efforts were put to integrate silvicultural

strategies in forest management planning for sustainable harvesting of timber resources.

The Department of Forests & Park Services has offered significant support to the Natural Resources Development Corporation (NRDCL) in managing the forest management unit on a sustained yield basis.

The management of forest resources in Forest Management Units (FMUs) and Working Schemes (WSs) is based on the management objectives of ensuring sustained yield in perpetuity, providing social and economic benefits and maintaining environmental stability. All the FMUs have management plans drawn up by the DoFPS and approved by the Ministry of Agriculture & Forests. The NRDCL undertakes the operational activities in the FMUs and WSs in accordance with the management plans.

The NRDCL's practices of scientific management and highly mechanized logging has resulted in minimum damages to the environment and ensured long term sustainability of the forest resources. The Corporation is the sole government agency responsible for the sustainable management and use of the natural resources and has been successful in making these resources "affordable, accessible and available for judicious use in the best interest of the nation and people". It has also catered its services to the requirements of ad-hoc nature, such as the special allocations for construction of *Dzongs, Lhakhangs*, institutional buildings, hotels and bridges.

The operations of the NRDCL have also benefitted communities located within the FMUs. The forest roads were constructed passing through the remote villages, benefiting local communities in terms of economic growth and rural development.

Afforestation and reforestation program taken up over the years (i.e. 4,199.32 acres) have ensured that the harvested as well as blank/ degraded areas within and outside FMUs are reforested. It is also in line with the RGoB's policy to maintain at least 60% of the total land areas under forest cover for all times to come.

Notwithstanding the commendable progress and efforts of the Department and the NRDCL in ensuring sustainable utilization of the forests and also in addressing rapid development of housing, construction and infrastructure development of the nation, the RAA observed certain inadequacies where improvements are desirable as briefly outlined below:

- E Blue pine (*Pinus Wallichiana*) is dominant and demonstrates fast colonization mostly in mixed conifer forest and slightly in fir forest. Thus, reliable knowledge of forest succession is crucial for successfully designing management strategies leading towards desired future forest states.
- ☑ The condition of most fir (*Abies densa*) forests in Bhutan is unfavorable and most available stocks in FMUs were matured, diseased or in dying stage and, it was noticed that there is often no or only little regeneration of fir.
- Limited understanding of regeneration dynamics of broadleaved forests brings considerable doubts regarding the best silvicultural systems. The survival status of natural regeneration in the forest management units is far from satisfactory where the floral diversity is more complex and the grazing problem is rampant.

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- Directional tree felling techniques were not applied or executed in the field by field workers. Directional tree felling is vital for felling the trees in desired direction to maximize volume of commercially viable timber and minimize threats to fellow workers and opening of unplanned forest canopy.
- E While protected areas like national parks, nature reserves, and wildlife sanctuaries intend to protect important ecosystems, the FMUs are designated areas for timber harvesting. It is apparent that these contradictory tasks can't occur in same areas or places. However, the audit noted intersection of FMUs areas with protected areas. Similarly, community forests areas also intersect with FMUs areas.
- ☑ There were inadequacies in Forest Management Plans such as preparation of plans by individual planners rather than involving a team or collective efforts, and lack of tentative schedule of management activities.
- Impact Assessment on flora & fauna or forest eco-system was not carried out. The timber harvest operation is likely to alter the quantity, quality, and distribution of flora & fauna habitat.
- Mutual understanding on standards, criteria and benchmarks on coupe clearance requirements between the DoFPS and the NRDCL was generally lacking.
- The monitoring & evaluation forms prescribed in the Forest Management Code of Bhutan were not fully maintained which may provide necessary basis and information for future planning and decision makings.
- ☑ Violations of some of the National Environment Commission Secretariat (NECS) terms and conditions were noted during the field visits. The clearance letter clearly instructs that the non-compliance to the terms & conditions shall result in revocation of the clearance. However, violations noted by the audit did not result in revocation of the clearances. This indicates inadequate monitoring by the NECS.
- Occupational Health and Safety (OHS) measures were not adequately implemented in most of the harvesting sites visited by the audit team. The audit witnessed several incidences of workers handling unsafe activities like harvesting, logging & transportation without basic safety gears.
- E From the review of a list of logging machineries, some of logging machineries were found as old as twenty years. Use of old heavy machineries and equipment may pose serious hazards to operators and those working in the vicinity without proper safety gears.

WHAT RAA Recommends?

Environmental Audit on the operations and practices of Timber Harvesting in FMUs and WSs

Based on the RAA's reviews and findings, the recommendations are provided with an attempt to address the identified deficiencies and weaknesses as provided below:

- ☑ Based on well researched forest succession trends, the DoFPS needs to fit in appropriate prescriptions to guide tree species composition and maintaining healthy and native tree species composition.
- ☑ Robust management prescription should be provided to ensure successful regeneration or rebirth of fir (*Abies densa*) forests after harvest.
- ☑ Monitoring by the DoFPS in harvest operations needs to be strengthened. The monitoring & evaluation forms prescribed in the Forest Management Code of Bhutan should be fully maintained and documented.
- ☑ Monitoring on compliances to clearance terms & conditions should be ensured by the NECS.
- ☑ Vigorous regeneration strategies, treatments and planning needs to be prescribed for broadleaved forests particularly in cases where regenerations were not effective.
- ☑ The issue of intersection or overlapping of FMUs areas with protected areas and community forests should be sorted out with appropriate authority.
- ☑ Preparation of forest management plans by individual planner should be discouraged. Plans should be prepared through involvement of a team or collective efforts.
- ☑ Tentative schedule of harvest, regeneration and other crucial management activities should be prescribed in the FMPs.
- ☑ Use of old heavy machineries and equipment should be discouraged to ensure safety of operators and those working in the vicinity.
- ☑ Occupational Health and Safety (OHS) measures should be implemented and use of safety gears in field should be supervised and monitored.
- ☑ Mutual understanding on standards, criteria and benchmarks on coupe clearance requirements between the DoFPS and the NRDCL should be established.
- ☑ Post-Impact Assessments of few pre-selected major harvesting activities with immense foreseen threats to the environment and ecology should be carried out.

2. INTRODUCTION

Forests in Bhutan are predominantly natural stands of native species with mixed conifers and broadleaf forests as most dominant forest types. Prior to 1979, harvesting of timber was carried out by allotting working-coupes to contractors through open auctions. Later, the logging operation programs were nationalized and carried out departmentally by a Logging Division established under the Forest Department to encourage the practice of scientific management of forest resources on sustainable basis. However, the departmental operation had a severe drawback due to lack of financial autonomy and having to depend completely on government for its operating fund. Earning was directly remitted to the Ministry of Finance, as a result of which "plough-back mechanism" could not be applied for the revenue earned. Therefore, to overcome the departmental operational deficiencies, the Logging Division was established as Bhutan Logging Corporation (BLC) in 1984 under the Royal Charter.

In 1996, the BLC was upgraded to Forestry Development Corporation Limited (FDCL) and entrusted with commercial mandates. In November 2007, FDCL was restructured as Natural Resources Development Corporation Limited (NRDCL) as per the Executive Order of the Prime Minister vide letter No PM/01/07/571 dated 7th November 2007 with mandate to manage sand, stone and other natural resources in addition to timber. NRDCL is owned by Druk Holding and Investments (DHI), which is governed by the Articles of Incorporation under the Companies Act of the Kingdom of Bhutan 2000.

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The Department of Forests & Park Services prepares Forest Management Plans and submits the Plan to the Ministry of Agriculture and Forests for final approval. The approved Plan is then communicated to the NRDCL through the respective Territorial Divisions for implementation. The NRDCL implements Forest Management Plans in collaboration with Territorial Divisions as per the guidelines provided in the Plan.

The NRDCL has seven Field Divisions spread out all over the country, each of them covering the *Dzongkhags* as mentioned below:

SL. No.	Regional Divisions	Dzongkhags/Districts Covered
1	Jakar	Bumthang
2	Phuentsholing	Chukha & Samtse
3	Rinpung	Paro & Haa
4	Sha	Wangdue, Punakha, Tsirang, Dagana & Gasa
5	Wang	Thimphu
6	Zhemgang	Zhemgang, Trongsa & Sarpang
7	Zhonggar	Mongar, Trashigang, Trashi Yangtse, Pema Gatsel, S/Jongkhar & Lhuntse

There are 17 FMUs and 5 Working Schemes operating in seven regional divisions.

The map below shows the distribution of FMUs within the country:

Map showing FMUs in Dzongkhags

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in FMUs and WSs



The distribution and forest type found in different FMUs are as exhibited in the **Appendix II**. The region wise production and disposal of timber by NRDCL for the period from 2008 to 2012 are as given below:

Regional	2008		2009		2010		2011		2012	
Division	Production (in cft)	Disposal (in cft)								
Wang	283,106	246,098	268,999	271,613	167,868	188,863	200,453	208,190	357,727	290,610
Rinpung	492,138	419,678	394,639	436,790	347,244	433,773	405,122	389,275	610,362	577,184
Zhonggar	231,089	148,708	263,957	215,423	292,992	321,960	295,159	374,714	354,844	269,999
Sha	310,010	281,527	365,201	391,054	472,123	501,842	450,836	462,090	468,891	467,989
Z/gang	93,069	95,755	101,622	120,225	111,022	108,111	194,196	155,721	218,806	207,138
P/ling	231,375	190,714	117,706	163,214	67,311	60,727	67,635	61,269	75,492	79,963
Jakar	417,129	329,702	364,078	470,531	370,099	384,132	330,594	320,305	374,914	280,943
Total	2,057,916	1,712,182	1,876,202	2,068,850	1,828,659	1,999,408	1,943,995	1,971,564	2,461,036	2,173,826

Source: NRDCL

The region wise revenue generated from sale of timber by NRDCL for the period from 2008 to 2012 are as given below:

Regional Division	2008 (in Nu.)	2009 (in Nu.)	2010 (in Nu.)	2011 (in Nu.)	2012 (in Nu.)	Total (in Nu.)
Wang	27,429,922.51	32,278,609.75	23,344,062.98	25,607,853.92	42,659,881.36	151,320,330.52
Rinpung	45,932,005.81	49,053,999.86	70,758,664.43	41,446,420.70	75,962,773.29	283,153,864.09
Zhonggar	15,892,940.22	22,264,311.45	35,061,205.23	37,511,599.73	39,852,051.79	150,582,108.42
Sha	30,145,687.91	37,678,181.08	63,980,318.86	55,444,685.79	60,745,834.65	247,994,708.29
Z/gang	10,693,850.34	13,636,126.18	11,732,295.00	15,699,504.19	24,465,639.71	76,227,415.42
P/ling	22,304,323.75	18,078,039.79	10,712,650.00	6,616,644.22	13,455,199.84	71,166,857.6
Jakar	33,143,956.00	49,606,805.89	50,093,907.37	34,985,514.14	37,131,943.77	204,962,127.17
TOTAL	185,544,694	222,598,083	265,685,113	217,314,233	294,275,336	1,185,417,462

Source: NRDCL

Details of timber disposed by NRDCL under each disposal category for the period from 2008 to 2012 are as given below:

Disposal Category	2008 (in cft)	2009 (in cft)	2010 (in cft)	2011 (in cft)	2012 (in cft)	TOTAL (in cft)
Allotment to Sawmills (lucky dip)	0.00	0.00	3,997.39	1,662,507.04	1,371,397.29	3,037,901.72
Rural Allotment	97,168.45	119,477.35	160,494.57	213,078.60	185,192.66	775,411.63
Dzong/ Institutions	111,694.59	98,498.69	187,612.40	138,810.90	213,519.23	750,135.81
Direct allotment to individuals/ contractors, VVIP's	46,923.94	41,595.25	61,053.91	295,189.70	547,442.95	992,205.75
Sale through Auction	1,384,189.72	1,859,662.52	1,765,267.94	-	20,026.08	5,029,146.26

Source: NRDCL

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Part I: Progressive Developments in Forestry Management

Recognizing the potential value of forestry resources in Bhutan, the forestry management has come a long way with enactment of Forest Act 1969 which was the first Act passed by the National Assembly. Since then, many commendable achievements and progressive developments were witnessed in the forestry sector. A few significant ones directly attributable to the efforts of the Department of Forest & Park Services (DoFPS) and the Natural Resources Development Corporation Limited (NRDCL) are reported hereunder:

- 1. Many forestry legislations and policies were drawn as early as 1960s. The National Forest Policy 2011 is responsive to the provisions of the Constitution of the Kingdom of Bhutan 2008. It clearly spells out the priorities and functions of implementing agencies and also provide necessary legal framework for the Department for intelligent and sustainable management of the fragile forest resources. The legislations and policy provides for enabling provisions for upholding the stipulation of the Constitution which requires for maintaining 60% of the country's land under forest cover for all times to come.
- 2. The extent of forest cover (including shrub forests) which is the key indicator for the health of a country's natural environment exhibited significant increment from 72.5% in 1995 to 80.89% in 2010¹.
- 3. The management of forest resources in Forest Management Units (FMUs) and Working Schemes (WSs) is based on the management objectives of ensuring sustained yield in perpetuity, providing social and economic benefits and maintaining environmental stability. All the FMUs have management plans drawn up by the DoFPS. The NRDCL undertakes the operational activities in the FMUs and WSs in accordance with these management plans. Currently, there are seventeen FMUs and five Working Schemes in operations, covering the area of 168,031.43 Ha and 6,102.48 Ha respectively.
- 4. The NRDCL's operations of scientific management and highly mechanized logging has resulted in minimum damages to the environment and ensured long term sustainability of the forest resources. The Corporation is the sole government agency responsible for the sustainable management and use of the natural resources and has been successful in making these resources "affordable, accessible and available for judicious use in the best interest of the nation and people".
- 5. The NRDCL also caters its services to the requirements of ad-hoc nature, such as the special allocations for construction of *Dzongs, Lhakhangs,* institutional buildings, hotels and bridges.

¹ Bhutan Land Cover Assessment 2010

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- 6. The operations of the NRDCL have benefitted communities located within the FMUs. The forest roads were constructed passing through the remote villages, benefiting local communities in terms of economic growth and rural development.
- 7. Afforestation and reforestation program taken up over the years (i.e. 4,199.32 acres) have ensured that the harvested as well as blank/ degraded areas within and outside FMUs are reforested. It is also in line with the RGoB's policy to maintain at least 60% of the total land areas under forest cover for all times to come.

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8. The NRDCL in collaboration with the DoFPS has been responsive to the demands of rapid development of housing, construction and infrastructure development in the country.

Part II: Lapses and Deficiencies

There have been many commendable developments and initiatives towards promoting sustainable utilization of forest resources. However, the review of the existing system and the practices in timber harvesting operation in FMUs and Working Schemes by the NRDCL also indicated some inadequacies, inconsistencies and shortcomings as discussed below. The findings as detailed below were primarily inferred from the documents and information made available, and observations in the field by the audit team.

3.1 Scientific Management & Prescriptions

3.1.1 Inadequate interventions to forest succession

a) Forest succession is the temporal pattern of changes in tree species composition that occur following a disturbance that destroyed the existing forest cover. Timber harvests and forest fires are two such primary disturbances in Bhutan.

Reliable knowledge of forest succession is vital for successfully designing effective management strategies leading towards desired future forest states. It is also fundamental for developing plans to successfully guide tree species composition towards desired future forest states through forest management².

b) Currently, the DoFPS places immense importance for preserving natural dynamics of forest composition and structure. Successful application of these directions depends on thorough understanding of the patterns and processes of forest succession. The prevailing forest management practices focus primarily on sustained-yield management. As such, beside sustained-yield management, the RAA felt a need to focus on ecosystem management as well. Ecosystem-based

² Ontario Forest Research Institute, Ministry of Natural Resources

management seeks to organize human use of ecosystems while preserving flora and fauna and maintaining an ecosystem's ability to provide at a sustainable level.

- c) Successful ecosystem management involves strategic forest management planning, including the ability to project and to evaluate future forest conditions over the planning unit and horizon. Ecological research has long focused on understanding and predicting forest succession.
- d) The audit team, from field visits to various Forest Management Units, learned that the blue pine (*Pinus wallichiana*) is dominant and demonstrates fast colonization mostly in mixed conifer forest and slightly in fir forest.
- e) The photograph shows colonization of fir and mixed conifer forests by blue pine. In most of the harvested mixed conifer forests of FMUs, blue pine was dominant naturally regenerated species resulting in change of species compositions.

Given such developments, the DoFPS



Beside sustained-yield

management, there is a need

to focus on ecosystem management

Colonization by blue pine in fir/MC forest

may consider fitting in relevant prescriptions based on appropriate research and reliable statistics in their FMPs to manage forest composition and structure as deemed appropriate by the Department.

- g) During the exit meeting, the audited agencies responded that the whole FMU is zoned based on forest function mapping whereby areas are assigned ecosystem functions besides production of timber.
- h) The forest function mapping outlined in Part 2 of the Forest Management Code of Bhutan (FMCB) provides prescriptive guideline towards better ecosystem management. However, the management prescriptive in the FMPs and the operations in the field by the NRDCL generally lacked strict compliance. The FMPs were mostly aligned to sustained-yield. Besides strengthening the practice of forest management planning and mapping, the DoFPS may consider initiating and prescribing other similar practices to make the focus on ecosystem management more visible and stronger.

3.1.2 Fir forests require appropriate management prescriptions

a) Fir (*Abies densa*) forests are found on the highest ridges and it requires relatively higher precipitation. A thick layer of moss with rhododendron, sub-alpine bamboo, primula and bryocarpum hamalaicum characterizes the undergrowth. Few hemlocks (*Tsuga dumosa*) and birches are also present. The condition of fir forests



f)

in Bhutan is harsh and unfavorable. Most available stocks in FMUs were matured and in dying stage and also in many cases no or only little regeneration of fir was observed.

- b) The inner wood of most fir trees in FMUs were found decayed or rotten which may be an indication of infestation by disease(s). As a result, wastages in fir timber harvests were seen very high.
- c) The physical observation by the audit in FMUs indicated that there is often no or only little regeneration of fir. Instead, regeneration of spruce (*Picea spinulosa*), hemlock and larch were observed in harvested fir forests areas. These are the facts which have to be considered in planning harvest operations in fir forests.



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in FMUs and WS:

Decayed inner wood

- d) From the field visit and enquiries with the NRDCL and FRMD (DoFPS) regional staff, the need for enrichment planting is apparent given the unsatisfactory regeneration for observation period of more than ten years. The artificial plantations at Chelela areas by Rinpung region clearly illustrate the success of fir plantation.
- e) The audited agencies replied that this condition may have persisted due to unfavorable micro climate and site specific climatic factors. The RAA was informed that latest research findings on fir forest regeneration will be incorporated in future management plans.

3.1.3 Broadleaf forests claims more regeneration treatments and planning

- a) Harvesting alters the forest in different ways. It changes the understory light environment and climate, vegetation, and disturbs humus and soil on the forest floor.
- b) Sustainable forest management depends on successful forest regeneration. The survival status of plantations in the FMU is generally challenging in the broadleaved forests. Poor regeneration in broadleaf forests is mainly attributed to complex floral diversity and rampant grazing problem.
- c) As recommended by the RNR-RC Yusipang, planners prescribed Group Selection System with artificial regeneration. Nevertheless, inadequate understanding of regeneration dynamics brings considerable doubts regarding the best silvicultural systems for broadleaved forest. The diverse species common in broadleaved forests complicates evaluation of regenerative capacity.
- d) It is important to have detailed silvicultural regeneration prescriptions and site specific regeneration strategies for broadleaved forests. For instance, plantation

and enrichment plantation may form the prescription and afforestation with selected local species as a regeneration strategy.

- e) Afforestation with selected species is currently being implemented in Wangdigang FMU, Zhemgang. According to regional office of Zhemgang, plantation of walnut trees (*juglans regia*) proved successful in areas threatened by cattle grazing. Therefore, such be-fitting strategies should be studied/researched and proposed in FMPs.
- f) The RAA was informed by the audited agencies that the RNR-RC has carried out some research on broadleaved forest regeneration and developed strategies which will be incorporated in future FMPs.

3.1.4 Directional tree felling method not adequately implemented

- a) It is important that tree felling is planned very carefully. Trees must be felled safely and in the direction intended to fall. Although safe tree felling requires great care and precision, nevertheless, well planned felling not only ensures safety but also makes it easier to continue with planned work. A well-planned felling gives quality cut logs. The directional felling can be made in number of ways depending on the condition of the tree, the terrain and the obstruction on the ground.
- b) In directional tree felling method, before cutting down the tree, the area around the marked tree is cleared to remove obstructions and the tree and area are

inspected for odd shapes, wind direction, and defects. Also the escape paths, hazards that maybe generated on other neighbouring trees are identified.

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c) However, tree felling activities observed at site by the audit team made it clear that directional felling method was not adopted in many cases. As a result, many logs were splintered along the length of the



Breakage of prime timber caused by improper directional tree felling

log, reducing the volume of commercially viable timber from the felled tree. Some of the tree fellers, during enquiries, admitted that the trees were cut based on their own expertise and convenience without any knowledge on directional felling.

- d) Some falls also triggered breakage of prime timber and nearby trees; and opening up more canopy area than planned.
- e) According to audited agencies, depending on terrain and field conditions, directional felling is not always implementable. Audited agencies mentioned that they are starting departmental logging by hiring certified and trained chainsaw operators and employing qualified supervisors. They also ensured that the techniques are applied in the field and carry out vigilant monitoring.

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3.2 Planning and Administration

3.2.1 Over-lapping of FMUs areas with protected areas and Community Forests

a) While protected areas of Bhutan like national parks, nature reserves, and wildlife sanctuaries intend to protect important ecosystems, FMUs are designated areas for timber harvesting. It is apparent that these two contradictory tasks can't occur in same areas or places. However, when FMUs map was overlaid to the protected areas map in GIS software, the audit noted intersection of FMUs areas with protected areas as depicted in the map given below. Environmental

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FMUs and WSs



The details of facts presented in the above map are tabulated below:

Sl. No.	FMU	Status	Name of Protected Areas (Intersecting with FMUs)	Intersection (in acres)
1	Dawathang	Operational	Wangchuck Centennial Park	187.06
2	Rudongla	Planning	Wangchuck Centennial Park	13,543.12
3	Lonchu	Operational	Torsa Strict Nature Reserve	316.22
4	Rudongla	Planning	Thrumshingla National Park	11,069.40
5	Chendebji	Operational	JSWNP	4,606.69
6	Khosela	Potential	JSWNP	576.09
7	Wangdigang	Operational	JSWNP	15.21
8	Dongdi	Operational	Bumdeling Wildlife Sanctuary	335.57
9	Rongmanchu	Operational	Bumdeling Wildlife Sanctuary	3.74
	30,653.10			

b) Similarly, FMUs map was overlaid to the community forests map using GIS software, and noted intersection of the two areas. The FMUs and Community Forests have distinct objectives and functions with differential management prescriptions. Therefore, the intersection or overlapping of FMUs with community forests may give rise to conflicting interests and management difficulties.

The map below depicts the intersection of FMUs with the Community forests.



The details of facts presented in the above map are tabulated below:

Environmental Audit on the operations and practices of Timber Harvesting in FMUs and WSs

Sl. No	FMU	Status	Name of Community Forests (Intersecting with FMUs)	Intersection (in acres)		
1	Chendebji	Operational	Tangsibjee CF	297.30		
2	Karshong	Operational	Samdrupcholing CF	114.36		
3	Paro-Zonglela	Operational	Khangkhu Pendeling, Jariphensum, Druk Tsenden, Ngoba Phensum, and Namjo	2,963.28		
4	Korila	Operational	Orphung, Yakpogang & Wamakhar	1,593.77		
5	Haa-East	Operational	Jabalingshi, Shari Samar, and Tshapey Isu	867.48		
6	Wangdigang	Operational	Dangkhar	385.49		
7	Lingmethang	Operational	Masangdaza	223.94		
8	Khaling-Kharungla	Operational	Yoezer Choeling, Namseyling, and Jonsham Lomdoksa	1,965.13		
9	Bitekha	Operational	Drukthunphen Zhi	14.74		
10	Rongmanchu	Operational	Zhasela	5.56		
11	Rudongla FMU	Planning	Shambayung	121.00		
Total areas of intersection (acres)						

c) The Department informed that the overlapping of proposed FMUs with protected areas were verified using GIS prior to finalization of FMU boundaries and all potential FMUs were identified in line with the Forest Resources Potential Assessment (FRPA) 2004 endorsed by the Ministry. The replies also indicated that overlapping of FMUs and CFs existed due to presence of villages and towns within the FMUs. However, the Department assured that FRPA 2014 will exclude forests in perimeter of villages/settlements and CFs will not be allowed in FMUs. During the Audit Exit Conference with the audited agencies, the RAA was informed that overlapping occurred mainly because of difference between physical or actual field boundary outlining and the virtual map representation of the boundary.

3.2.2 Inadequacies in Forest Management Plans (FMPs)

A forest management plan is a detailed written document to enhance and protect the values and aspects of the forests that are most important. It is indispensable tool for planning sustainable forest management operation. However, some inadequacies were noted in preparation of FMPs as discussed below:

- a) The FMP does not reflect the season when the proposed final harvest and regeneration will occur. The plan may not be rigidly prescriptive but should provide proposed pertinent or relevant information in preparation of operational plans. Schedule may be helpful to make the most from desirable seasons for harvesting and regeneration and to align a timber harvest operation to the requirements of ecology, forest operations, business, market force, etc.
- b) In few of the operational plans (OPs), regeneration timings was explicitly specified but not in all OPs. Most OPs and FMPs lack schedule of management activities.
- c) It was also observed that the FMPs were generally prepared by individual planner in the FRMD. There is no practice of forming and assigning a team to prepare a plan.

3.2.3 No post-impact assessments conducted in harvested FMUs

- a) The FMU is an area of the forest identified and put under scientific management that not only produces timber for sale but also revitalizes the forest health. Therefore, it is also important that periodic impact assessment is carried out to evaluate the harvesting operations' impact on the wildlife and eco-system to ensure that activities carried out does not endanger eco-system.
- b) An assessment would not only confirm but also validate the environment friendliness of the various harvesting activities. Should there be any deviation, impact assessment could facilitate timely interventions to rectify lapses.
- c) The RAA was informed that the current practice is to carry out pre-impact assessment during planning phase and post assessment was not carried out to avoid additional costs.
- d) It may not be feasible to carrying out post impact assessment every time for all harvesting activities where the primary objectives of the FMU are sustainable timber harvesting. However, FRMD may identify and prioritize few harvesting activities with a huge potential of creating negative impact on environment and ecosystem for carrying out post-impact assessment.

3.2.4 Uniform procedures for coupe clearance not followed

a) The Coupe Clearance Certificate is a mechanism to ensure that the concessionaire cleans up the coupe (work site) after completion of harvesting operations and before moving on to the next coupe identified for harvesting. This is done to guarantee that all useable timber is removed from the coupe and all unwanted debris are cleared and disposed so that the coupe's aesthetics are maintained

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while at the same time the forest's natural regeneration process is unhindered by undesirable remains.

- b) The audit team visited numerous FMU harvesting sites and observed that while the coupes under Zhonggar and Rinpung Regions were fairly clean, some coupes in FMUs and WSs under other regions were found unkempt and messy. The discussions with officials from both from the DoFPS and NRDCL revealed lack of an understanding of what exactly is required to be done. Some officials reasoned that some amounts of debris are necessary for providing nutrients to the geminating seeds but couldn't interpret the extent of debris required in the coupe.
- c) While all Forest Management Plans (FMP) require coupe clearances before moving onto the next coupe, none of the plans explain in detail what a coupe clearance is and what criterion needs to be met in order for a coupe to receive the clearance certificate.
- d) Due to lack of clarity in requirements for coupe clearance, there is no consistency and uniformity in understanding and implementation of this requirement. While arguments from both sides were convincing, clarity needs to be established for better interpretation and implementation in managing coupes. This could clarify on how much clearing needs to be done or how much and what debris can be left in a coupe to suit regeneration, aesthetics and ecosystem.

3.3 Monitoring

Environmental Audit on the operations and practices of Timber Harvesting in FMUs and WSs

3.3.1 Inadequate monitoring of harvesting activities by the DoFPS

- a) The FRMD, DoFPS is required to provide technical backstopping in all areas of sustainable management of forest resources and prepare forest management plans (FMPs) for FMUs. Based on these FMPs, the NRDCL carries out the harvesting operations.
- b) During the field visits and verifications of monitoring forms in regional offices, the audit observed that most of the regional offices have not filled or maintained the monitoring and evaluation forms prescribed in the Forest Management Code of Bhutan.
- c) The reason for not maintaining the forms, as pointed out by officials from the regional offices was lack of technical capacity to understand the intricacies of the forms.
- d) However, few regional offices have maintained some forms but not all the prescribed forms.

3.3.2 Monitoring by the National Environment Commission Secretariat (NECS)

a) Based on the FMPs, the NECS issues environmental clearances for operation of FMUs and WSs necessitating compliance to a number of terms and conditions indicated therein. The terms and conditions vary with situations and circumstances and nature of the FMUs and WSs.

Violations of NEC terms & conditions were evident from the site visits

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WSs

- b) Violations of few such terms and conditions were evident from the site visits to FMUs and WSs. The frequently violated terms and conditions include:
 - Aesthetic value must be preserved or enhanced. Visual impact on the environment due to harvesting operations should be minimized;
 - ⊕ Waste materials (timbers, soil, stone, etc.) must be disposed-off in designated areas;
 - Occupational health & safety measures must be strictly maintained at all times;
 - \oplus Ecologically important sites should not be adversely affected by the harvesting operations;
 - Lops & tops must be managed properly to ensure maximum survival of regenerations; and
 - First aid kit should be made available at the worksite at all times;
- c) The clearance letter clearly instructs that the non-compliance to the terms and conditions



Lops & tops in river/stream

shall result in revocation of the clearance. However, above violations noted by the audit did not result in revocation of the clearances.

3.4 Occupational Health & Safety (OHS)

3.4.1 Lack of enforcement of OHS measures in the field

a) During the entire logging process of felling the tree, cross cutting and transporting, operators and workers are at risk of hazards from the environment, nature of task, machineries and equipment. Safe working conditions and protective clothing ensure that all possible risks are taken into consideration.

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 b) The Rules and Regulations on Occupational Health and Safety (OHS) states that all employers must provide workers with the information, instruction, and supervision necessary to ensure the health and safety of those workers in carrying out their work and to ensure the health and safety of other persons at the workplace.



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Workers without protective gear

practices. At the FMU (Gidakom) the audit team observed logs being brought to road points by cable cranes and being loaded on trucks for transportation to depot by the hired employees without any safety gears. While some had gloves, none of them had helmets and other gears during the entire process of loading logs onto trucks. The site visits in other regions also exhibited similar cases.

- d) The DoFPS personnel need to strictly monitor the safety protocols that need to be followed and adopted by operators and other employees at site.
- e) While the reluctances from users are noted, no practice can be put in place without strict implementation that will gradually become a norm that is accepted and followed by everybody.
- f) The NRDCL admitted that lapses on implementation or enforcement of requirements and contractual terms and conditions by the private loggers and lack of strict supervision were main grounds for poor workplace safety practices.

3.4.2 Obsolete machineries & equipment

- a) The NRDCL's current fleet of machineries and equipment are claimed to be state of the art technologies that are not only practical and environment friendly but also the most ideal for Bhutan's terrain.
- b) During field visits, it was visible that most machineries being used were very old and some have past their serviceable or productive life span.
- c) From the list of machineries provided by the NRDCL, it was evident that many logging machineries were procured in late 1980s and 1990s as indicated from the registration date of the machineries and equipment. The old heavy machineries and equipment may pose serious hazards to operators and those working in the vicinity.
- d) Use of old machineries & equipment that have served their purpose beyond its guaranteed lifespan should not be encouraged. Regular inspection and maintenance needed to be carried out to ensure that no mishaps occur due to machine failures.

- e) The management of the NRDCL informed that they are in the process of phasing out the old machineries. However, the NRDCL admitted that such phasing out process will be slow and may need some time depending on availability of funds for new purchases of machineries.
- f) An appropriate asset management system to track some common key performance metrics, such as asset utilization rate, maintenance cost, performance reliability, lifespan duration, etc. may be helpful to attain gradual, steady and continuous replacement of machineries.

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Based on the review of existing system and findings, the RAA recommends following course of actions:

4.1. Colonization of native species by dominant tree species should be controlled

The blue pine (*Pinus wallichiana*) was found to be dominant demonstrating fast colonization in mixed conifer and fir forest. Regeneration of spruce (*Picea spinulosa*), hemlock and larch were also observed in harvested fir forests areas. These facts clearly demonstrate differences in naturally grown or regenerated native tree species before and after harvesting operations. Wherever possible, management prescriptions should be provided to minimize colonization by the dominant species and disturbing the desired forest composition and structure.

4.2. An appropriate management prescriptions should be provided to ensure successful regeneration or rebirth of fir (*Abies densa*) forests after harvesting

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Fir is the most preferred species for shingles, planks and beams used in the construction of houses and sheds. In many cases, no or only little regeneration of fir was observed. Regeneration of spruce, hemlock and larch were observed in areas of harvested fir forests. Therefore, an appropriate management prescription to retain fir forests or to ensure regeneration of fir trees should be included in plans.

4.3. Vigorous regeneration strategies, treatments and planning needs to be prescribed for broadleaved forests particularly in cases where regenerations were not effective

Broadleaved forest has complex floral diversity. As a result, regeneration failures are often very common in broadleaved forests, particularly in areas challenged by rampant grazing problems. Therefore, as compared to other forest types, broadleaved forests should be given preference in advocating vigorous regeneration strategies and treatments.

4.4. Directional tree felling techniques should be applied exclusively in the field

Employing directional felling techniques simplifies the felling process. One can control where and to a certain extent how the tree falls. Directional felling techniques allow one to move away from the falling tree and observe from a safe distance rather than standing right beside the falling tree. The application of directional felling techniques in field should be supervised and monitored generally in all FMUs and particularly in areas operated by the private loggers whose commercial motives supersedes silvicultural practices.

4.5. The over-lapping of FMUs areas with protected areas & community forests cases should be avoided

Such overlapping cases may result in reduction in FMU operable areas which could hamper the sustainability of the NRDCL. The NRDCL makes huge investments in FMUs

and it would have severe financial implications if the FMUs had to be withdrawn due to conflict with conservation activities and interest of community forests.

Thus, the issue of intersection or overlapping of FMUs areas with protected areas and community forests should be sorted out.

4.6. Tentative schedule of harvest, regeneration and other crucial management activities should be prescribed in the FMP

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It will be helpful for the implementers if the plans specify the date when the proposed/predicted final harvest and regeneration will occur. It may be long-term predictions and often are approximate as best. This doesn't mean that a plan should be rigidly prescriptive but should provide pertinent information and direction for operation of FMUs and WSs.

4.7. Post-Impact Assessments for the selected harvesting operations or areas should be carried out

The impact includes direct and indirect effects on water yield, individual plant and animal species, as well as broad changes in ecosystem structure and function. Harvesting impact assessments provide feedback about the quality of forest harvesting operations and may be undertaken regularly for every harvesting operation or for selected major operations. Environmental impacts associated with harvesting trees may include undesirable changes to ecosystems, in particular localized fauna loss, changes to natural flora ecology, etc. Impact assessment on flora fauna and eco-system as whole by harvesting activities should be carried out. Currently, the practice is to carry out pre-impact assessment during planning phase but not the post assessments.

The FRMD should list down or identify and prioritize few harvesting activities or areas with a huge potential of creating negative impact on environment and ecosystem and accordingly carry out post-impact assessments of those prioritized harvesting operation or areas.

4.8. Mutual understanding on standards, criteria and benchmarks on coupe clearance requirements between the NRDCL and DoFPS should be established

A clarity needs to be brought for better interpretation of the definition in managing coupes. The extent of coupe clearance is fully dependent on impulses of the FMU field managers and lacks clear delineation and standards. Thus, standards and benchmarks on coupe clearance requirement should be formulated and mutual understanding of such standards and benchmarks between the NRDCL and DoFPS should be established.

4.9. Monitoring by DoFPS and NECS in harvest operations and activities should be strengthened

To ensure that the on-ground activities are carried out as per plan to meet the objectives of the plan, it is important that an efficient monitoring and evaluation be carried out by the relevant authorities. The monitoring & evaluation forms prescribed in the Forest Management Code of Bhutan should be fully maintained and documented.

Monitoring on compliances to clearance terms and conditions should be ensured by the National Environment Commission Secretariat.

4.10.Occupational Health and Safety (OHS) measures should be employed and use of safety gears in field should be enforced

In line with the General Rules and Regulations on Occupational Health and Safety (OHS), workers must be provided with the information, instruction, monitoring and supervision necessary to ensure the health and safety in carrying out operations in the field. The contractual terms & conditions agreed by the private loggers should be strictly adhered and implementation of safety gears should also be strictly enforced.

4.11.Use of old heavy machineries and equipment should be discouraged to ensure safety of operators and those working in the vicinity

The old heavy machineries and equipment may pose serious hazards to operators and those working in the vicinity. Benchmark or standard of machineries & equipment to be fielded should be formulated and use of very old machineries & equipment should be discouraged. An appropriate asset management system should be in place to ensure gradual and steady replacement and maintenance of machineries.

Environmental Audit on the operations and practices of Timber Harvesting in FMUs and WSs



APPENDIX I

้จังสุม 55 สุขุม ธังารูส เจขุ **ROYAL GOVERNMENT OF BHUTAN** MINISTRY OF AGRICULTURE AND FORESTS DEPARTMENT OF FORESTS AND PARK SERVICES **THIMPHU: BHUTAN** "Sustaining Forest Resources for Present and Future Generations"

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March 10, 2014

FRMD/MPS/1(g)/2013-2014/ 792

The Sr. Deputy Auditor General Department of Performance & Commercial Audit Thimphu

Subject: Draft Environmental Audit Report on Timber Harvesting in FMUs & WS

Dear Sir,

Please find enclosed herewith the recommendations from Department of Forests and Park Services and Natural Resources Development Corporation Limited to Royal Audit Authority (RAA) on draft Environmental Audit Report on Timber Harvesting in FMUs & WS as deliberated and endorsed during the exit meeting held on 13th February 2014 at 10:30am at NRDCL conference hall.

Therefore, we would kindly request sir to incorporate the recommendations in the final report prior to submitting to the Cabinet.

Thanking you for your continued support.

Yours sincerely,

(Chencho Norbu) **Director General**

Cc:

- 1. The CEO, NRDCL for kind information.
- 2. The CFO, FRMD for follow up.
- 3. Office copy for record.

Royal Audit Authority Thimphu: Bhutan 49 NO.

RSAD

Forest Resources Management Division.

Fax: +975-02-322560

Sl. No.	Audit Finding	Justification	R	Recommendation to RAA
1	Prevailing forest management practices focus primarily on sustained yield management and less focus on ecosystem management	 The whole FMU is zoned based on forest function mapping, whereby areas are assigned ecosystem functions including protection besides production of timber. The forest management plans focus on maintenance of sustained yield only in areas zoned as production area. In general protection of flora, fauna, local water supply, riparian reserves, aesthetic values, religious monuments, wildlife habitat, watershed, etc. are observed in all FMU's. Already 51.44% of the country's area is under Protected Area System which is based on ecosystem management Only 5.6% is under FMU. The main objective of operating a FMU is sustainable production of timber and not ecosystem management. 	•	3.1.1. Lack of forest succession and ecosystem management. "Lack" to be replaced with an appropriate word Para in 3.1.1 (b) may be rephrased (<i>please refer</i> <i>attachment in red</i>)
2	Poor regeneration of Fir and colonization by Spruce, Hemlock and Larch observed in harvested Fir forest areas	 Silviculture system prescribed in Fir forest is research based, but this condition may have persisted due to unfavourable micro climate. Poor regeneration of fir is due to unavailability of sufficient water during winter season as reported in research findings carried out at Chelela. It is also due to forest succession and global warming that fir forest is often colonized by spruce, hemlock and larch. Latest research findings on Fir forest regeneration will be incorporated in future management plans. 	•	3.1.2 Fir forests demands robust management prescriptions may be rephrased.
3	Broadleaf forests claims more regeneration treatments and planning, i.e. site specific regeneration strategies for broadleaved should be studied/researched and proposed in FMPs	 RNR RDC has carried out ample research on broadleaved forest regeneration and developed strategies which will be incorporated in the FMPs. In general, broad leaved species are more palatable compared to conifer species and therefore are heavily grazed by animals. However, other indigenous species other than walnut could be planted in areas susceptible to cattle grazing. Further research, however, if required is subject to availability of fund. 		
4	Directional tree felling method is not practised in FMU.	 In ideal situation and in areas where terrain is favourable, the field CFO's should ensure that proper directional felling techniques are strictly complied with by NRDCL. However, depending on terrain and field conditions, directional felling is always not implementable particularly in MWH forests otherwise as far as possible it is being done. NRDCL has been carrying out logging operations through logging license holder contractors who usually have trained operators otherwise DoFPS do not recommend & 	•	3.1.4 Directional tree felling method not in practice – It is practiced in the field but it is not always possible to implement it in the field due to terrain

		 forward their application to MoEA for issuing logging license. Besides, NRDCL has been imparting training to chain saw operators (engaged by the contractors as well as departmental operators) time to time through qualified trainers. From this year NRDCL has started departmental logging by hiring trained chain saw operators particularly adhoc logging operations as the contractors are not interested to take up such works due to sporadic works. Further, NRDCL has also started recruiting qualified supervisors. During 2013 NRDCL recruited 5 supervisors and send them to <i>UWICE, Lamegonpa</i> for training. However, NRDCL will intensify supervision in the field besides, imparting frequent training to the chain saw operators to minimize the felling damage as recommended by RRA All logging license holder must have trained chain saw operator. This is insured during approving of logging license. NRDCL shall insure that the techniques are applied in the field and carry out vigilant monitoring. 		condition. Therefore, title may be rephrased.
5	Overgrown seedlings were noticed in NRDCL nurseries which could not be transplanted.	 NRDCL will be asked to transplant seedlings in time before it is overgrown in nurseries. Mostly in conifer areas as the plantation creation under Wang and Rinpung Region has decreased over the years. In future, NRDCL will create nurseries based on proper planning of future activities based on FMU Plan and plantation outside FMUs. It was also recommended to distribute the overgrown seedlings, which are not useful for NRDCL, to general public for free of cost. The old seedling at Changkaphu & Chelaila is the leftover of 2nd forestry project (87-97). During that time due to bark beetle epidemic in western region all the dead & dying trees that were affected by beetle was clear felled. In order to reforest those areas two nurseries as above were upgraded and raised enough seedlings. The present seedlings are the left over after completing the reforestation works. However, every year on small scale NRDCL is selling these seedlings to Thimphu & Paro municipality, as Christmas tree, chadree etc. 	•	3.1.5 Nursery management may be omitted.
6	Over-lapping of FMU areas with PA and CF lack of co- ordination between WCD &	• Over-lapping of proposed FMUs with PA's are verified using GIS prior to finalization of FMU boundaries. Overlapping of FMU and Park occurred because FMUs were established before the Parks. The Park boundaries are not yet demarcated in the field. This issue will be solved soon as demarcation of park boundaries is being carried out. There is co-ordination between WCD and FRMD.	•	3.2.1Intersection of FMUs areas with National Parks & Community Forests (b) & (c) may be rephrased/omitted

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	 FRMD selection of FMUs were not carried out properly overlapping of FMU & CF may give rise to management collision 	 All such potential FMU's are identified in line with Forest Resource Potential Assessment (FRPA) 2004, endorsed by the Ministry. FMU are selected properly through detailed planning and survey. Currently there are incidences of CF's being established in FMU's. This is due to large size of FMU's which included even villages and towns in the past. However, in future, as per FRPA2014, all such forests in the perimeter of villages will be excluded from FMU's and CF's will not be allowed in such FMU's, particularly in production forest. There will be no collision in the management of CF and FMU as they will be guided by separate management plan approved by the Ministry 	
7	Minimal or absence of wildlife considerations in FMPs	 Wildlife component is already included in detail in FMP wherein presence/absence of endangered wildlife or critical habitat is considered right from the inventory stage of the FMU. Accordingly, prime wildlife habitats, snag trees are prescribed to be retained in the FMP. Yearly monitoring of wildlife is also carried out in the FMUs. M&E forms no. 9 specifically deals with wildlife monitoring in the FMUs. Data on wildlife is collected from transect and non-transect areas to check the indicator species of wildlife in the area. Notwithstanding, the primary focus is on sustainable production of timber and other renewable resources. A total of 51.44% of the country has been set aside for conservation purposes. 	 3.2.2.1 Minimal or absence of wildlife considerations in FMPs, 3.2.2.1 (a), (c), (d) & (e) may be rephrased or omitted since it is adequately addressed in the FMP.
8	Forest Management Plans should be prepared by a team rather than by an individual	 The present system of preparing management plan is more or less a team effort since all the planners are involved in it even though one planner is assigned the main responsibility of writing the plan. This arrangement makes it easier to co-ordinate and process many aspects of the planning activities. He is responsible for bringing out the main plan but only through consultations with the other planners. If different planners are given the task of writing the same plan, it will be time consuming due to lack of co-ordination and it will be even difficult if more than one plan has to be prepared in a year. During 11th Monthly Meeting of FRMD held on 26th February 2014, it was recommended to continue with the current system of plan writing after weighing the pros and cons of writing by a team instead. 	3.2.2.2 Lack of collective or team efforts while preparing plans may be rephrased or omitted.
9	Lacking schedule of activities	• FMPs reflect forestry activities in general but it is reflected in detail in OP including time of harvest, regeneration, planting, etc. An OP is prepared annually for all 10 years of the plan period.	• 3.2.2.3 Lacking schedule of activities may be omitted since schedule of activities

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10			presetter the rest well	cribed can be found in management plan as as in OPs.
10	No studies or impact assessment conducted for flora & fauna in the FMU areas	• Form 9 & 10 of Environmental monitoring forms deals with monitoring of fauna and flora in the FMU which is carried out annually and 5-yearly evaluation. This more or less addresses the issues raised through 3.2.3(c), (d) & (f).	 3.2.3 asse flora area beca prod such addi 3.2.3 omit 	3 No studies or impact assments conducted for a & fauna in the FMU as may be rephrased ause FMUs are timber luction oriented and a studies involve tional costs. 3 (c), (d) & (f) may be tted.
11	Monitoring and evaluation forms in field offices were not maintained due to lack of technical capacity to understand the intricacies of the forms	 Monitoring at the field level is done by FMU In-charges on daily basis and CFOs, Territorial Divisions on monthly basis. All FMU In-charges were trained to fill M& E forms in June 2013. Department carried out final evaluation of Gidakom and Paro Zonglela FMUs in 2012 and its recommendations were incorporated in the new management plans. Department carries out mid-term and final evaluation of FMUs 	 3.2.4 harve be reinad harve be reinad harve 3.2.4 since in Ju char form 	 4 Poor monitoring of vesting activities may ephrased with lequate monitoring of vesting activities 4.1 (d) may be omitted e training was imparted ine 2013 to all FMU inges to fill up M & E ns.
12	Lack of standard procedures for coupe clearance resulting in non uniform practices amongst regions	 DFOs to strictly comply issuing coupe clearance certificate to NRDCL before moving on to next cable line. DoFPS and NRDCL is also coming up with modalities on utilization of lops and tops from within cable lines in FMU and outside areas like transmission line, road construction/widening works. 	• 3.2.5 Star Proo coup in n amo reph proo clear	5 Lack of standards/ ndard Operating cedures (SOP) for pe clearance resulting on-uniform practices ongst regions may be arased with Uniform cedures for coupe rance not followed.

APPENDIX I

13	Occupational Health & Safety measures not followed at the work place	 NRDCL will be asked to provide safety gears to the workers as stated in the FMPs NRDCL has been issuing safety gears since 2011-2012 besides; contractors have also been instructed accordingly and incorporated a clause in the terms & conditions & agreement deed. However, we will ask the Regional Offices to monitor in the field DoFPS should strictly monitor the compliance. Based on the contractual agreement, logging contractors are made mandatory to provide safety gears to workers. NRDCL too provides safety gears to its employee. Need to strengthen monitoring of field activities. 	•	3.3.1. Occupational health & safety practices may be rephrased because workers do not use safety gears although they are issued by contractors
14	Use of obsolete machineries and equipments for timber harvesting	 NRDCL will be asked to use machineries and equipments which are in good working conditions (same as above) To replace old machineries and equipments which are non-functional and risky to workers. NRDCL has started the replacement of the old machineries in the phased manner. Financial constraints are hampering the procurement of new machineries, which are very expensive in international market. However, NRCL is committed to it. Scientific logging operations started in early 1970s with FAO/UNDP supplied machineries. There after BLC & FDCL also purchased several logging machineries during 1980s and most of those machineries were sold to the logging entrepreneurs on govt privatization policy. There after NRDCL has 8 sets of cable crane which were purchased during 1995-2008; Penz loader 7 nos purchased during 1987- 2005; Telelogger 6 nos purchased during 1998. During 2013 NRDCL has kept budget for 2 sets of cable crane, one skidder and loader but due to financial crises NRDCL had to drop the proposal and same is the case during 2014. In addition to above NRDCL is also reviewing the timber harvesting technology in line with the existing silvicultural systems and pocket working areas in far flung areas where road construction is not economical. 	•	3.3.2. Obsolete machineries & equipment may be rephrased
15	Hon'ble Director General's Points:	 List of FMU/WS visited Sites visited Data/figure 	•	RAA may incorporate the list of FMU/WS/Sites visited in the report and data/figure to support the statement which is missing now

	Regional				% of total	Total Area
SN	Division	Dzongkhag	FMUs	Land use/ Forest type	FMU area	(in acres)
1	lakar	Bumthang	Karshong	Bluepine	19.53	
_	,			Mixed Conifer	21.61	11,598.09
				Logged area	8.69	
2	Rinpung	Наа	Haa East	Bluepine	31.23	17 500 01
				Mixed Conifer	39.12	17,599.01
				Fir	11.50	
				Cultivation	5.36	
				Alpine area	8.24	
				Grassland	3.06	
-			· ,	Others	1.49	
3	Rinpung	наа	Lonchu	Fir Mined Construct	29.99	31.056.69
				Mixed Conifer	35.36	. ,
				Bluepine	3.60	
				Non forested land	21.02	
4	Pinnung	Наа	Solola	Cultivation	31.02	
т	Kiiipulig	IIaa	Jelela	Alpine area	7 33	22,627.44
				Conifer	88.72	
				Others	0.72	
5	Rinnung	Наа	Bitekha	Protection area	30.00	
U	Tunpung		Ditterinta	Mixed Conifer	35.00	18,162.48
				Bluepine	9.00	
				Fir	14.00	
				Non-forested land	12.00	
6	Rinpung	Paro	Paro Zonglela	Fir	3.67	
				Mixed Conifer	45.64	39,912.74
				Bluepine	30.42	
				Shrubs	7.72	
				Meadow	1.83	
				Cultivation	9.08	
				Others	1.64	
7	Sha	Wangdue	Gogona	Protection area	34.00	19 403 86
				Mixed Conifer	55.00	17,405.00
-				Non-forested land	11.00	
8	Sha	Wangdue	Khotokha	Settlement	6.00	23.171.74
				Bluepine	54.00	-,
				Hemlock	16.00	
				FIF	7.00	
				Mixed Conifer	2.00	
				Mixed Conifer&Broadleaf	4.00	
				Non-forested land	3.00	
9	Wang	Thimphu	Gidakom	Agriculture & Settlement	3.86	
				Bluepine	22.73	27,053.80
				Broadleaf	0.77	
				Fir	7.27	
				Mixed Conifer	49.24	
				Scrub	5.19	
				meadow	8.91	
				Others	2.03	
10	Zhemgang	Trongsa	Chendebji	Cultivation	4.37	10 3/2 00
				Grassland	11.29	17,343.90
				Alpine area	0.94	
				Conifer	56.16	
				Broadleaf	21.79	
				Others	5.45	
11	Jakar	Bumthang	Dawathang	Fir	25.44	43.328.64
				Mixed Conifer	33.63	10,020.01
				Bluepine	19.76	
				Settlement & Cultivation	6.11	
		1	1	ivon-forested land	0.58	

Table showing distribution and type of forests under the FMUs:

APPENDIX II

12	Zhemgang	Zhemgang	Wangdigang	Agricultural dryland	2.57	22.04.20
				Cultivation (terraced)	4.09	23,064.38
				Tseri	2.49	
				Natural pasture	0.39	
				Rock outcrop	1.79	
				Alpine scrub	1.22	
				Conifer (Fir)	1.63	
				Mixed Conifer	19.17	
				Chirpine	8.90	
				Broadleaf	57.70	
				Water body	0.00	
13	Zhonggar	Lhuentse	Rongmanchu	Cultivation	8.60	15 000 01
				Grassland	2.90	15,823.01
				Scrub	2.20	
				Conifer	19.20	
				Broadleaf	67.20	
14	Zhonggar	Monggar	Korila	Broadleaf	64.19	24 100 21
				Chirpine	16.63	34,188.21
				Mixed Conifer	1.57	
				Scrub	1.88	
				Shifting cultivation	1.84	
				Cultivation	13.31	
				Others	0.57	
15	Zhonggar	Monggar	Lingmithang	Chirpine	5.60	26 112 10
				Broadleaf	38.25	26,113.18
				Protection area	37.00	
				Community forest	1.00	
				Non-forested land	9.00	
				Operated area	10.00	
16	Zhonggar	Trashigang	Khaling-	Broadleaf	63.64	24 002 10
			Kharungla	Chirpine	2.30	24,903.18
			-	Mixed Conifer	10.67	
				Scrub	9.84	
				Shifting cultivation	9.24	
				Plantation	0.03	
				Others	4.28	
17	Zhonggar	T/yangtse	Dongdeychu	Cultivation	1.60	11 047 02
				Grassland	0.20	11,047.02
				Broadleaf	69.20	
				Fir	28.71	
		1		Bluepine	0.35	

Field Visit Diary exhibiting sites visited by the RAA Team:

SI. No.	Name of Office/FMUs/WSs visited	Date
1	Zhonggar NRDCL Regional Office and DFO Office	25/03/2013
2	Lingmethang and Korila FMU	26/03/2013 to 27/03/2013
3	Jakar NRDCL Regional Office and DFO Office	29/03/2013
4	Dawathang FMU, Uruk WS, and Forest Thinning Sites	30/03/2013 to 01/04/2013
5	Zhemgang NRDCL Regional Office and DFO Office	03/04/2013
6	Wangdigang FMU, Kikhar WS and Malaya WS	04/04/2013 to 05/04/2013
7	Chendebji FMU	06/04/2013
8	Gogona FMU and Jogay WS	08/04/2013 to 09/04/2013
9	Wangdue NRDCL Regional Office and DFO Office	10/04/2013
10	Paro Regional NRDCL office and DFO office	11/04/2013
11	Zonglela FMU and Ragoe FMU	12/04/2013 to 13/04/2013
12	Selela FMU and Betekha FMU	15/04/2013 to 16/04/2013

AUDIT MANDATE, OBJECTIVE, SCOPE, CRITERIA & METHODOLOGY

Audit Mandate

Article 25.1 of the Constitution of the Kingdom of Bhutan and Section 3, Chapter 1 of the Audit Act of Bhutan 2006 state that *"There shall be a Royal Audit Authority to audit and report on the economy, efficiency and effectiveness in the use of public resources"*. The Audit Act also empowers the RAA to carry out special audits and any other form of audits that the Auditor General may consider significant and necessary. In line with this important constitutional responsibility, the RAA is required to audit and report on the functions and operations of the Government Agencies and other organizations and recommend measures to improve their economy, efficiency, and effectiveness in the use of public resources.

Audit Objectives

The audit is conducted with following two specific objectives:

- a. To evaluate the effectiveness of plans and regulations in sustaining the forest resources in FMUs and Working Schemes (WSs); and
- b. To determine whether the timber harvesting operation is undertaken in a sustainable manner, giving due consideration to the environment and ecosystem.

Audit Scope

The review covered harvesting operation carried out by the NRDCL in the Forest Management Units (FMUs) and Working Schemes (WSs). It covered a period of five years from 2008-2012. Field visits were made to selected FMUs and WSs as exhibited in **Appendix III**.

The audit review does not cover harvesting operations outside FMUs and WSs. Therefore, the issues on illegal timber felling outside FMUs and WSs will not be covered in this audit. The review also does not cover timber disposal and distribution system. The separate audit may be necessary for reviewing timber disposal system.

Methodology

The audit team engaged various methodologies in order to obtain and gather information, analyze data gathered and drawn conclusions. The team interviewed many of the department's officials and NRDCL's managers and field staff. The literatures, policy documents and studies carried out by individuals and professional bodies were reviewed to garner insights and information.

GPS and GIS software was used to collect and analyse map data. Primarily the team resorted for audit procedures mainly on interviews and literature review of secondary data, and physical observation, wherever applicable.



"Every individual must strive to be principled. And individuals in positions of responsibility must even strive harder" - H.M The King Jigme Khesar Namgyel Wangchuck

