JOINT IMPLEMENTATION LAND USE, LAND-USE CHANGE AND FORESTRY PROJECT DESIGN DOCUMENT FORM
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SECTION A. General description of the LULUCF project

A.1. Title of the LULUCF project:

Bikin Tiger Carbon Project - Permanent protection of otherwise logged Bikin Forest, in Primorye Russia

Version Number 1.5
Date: 26/10/2012

Prepared by GFA ENVEST GmbH (Mr. Martin Burian), WWF Germany and WWF Russia, Amur Branch for Tribal Commune Tiger (TCT).

The proposed JI project qualifies as 'Forest Management' under activities referred to in Article 3, paragraph 4 of the Kyoto Protocol, as defined in paragraph 1 of the annex to decision 16/CMP.1. The Russian Federation opted to account for sinks and sources from Forest Management.

A.2. Description of the LULUCF project:

Project Objective. The Tribal Commune Tiger (TCT), an economic interest group formed by the local tribe of the Russian ethnic group of Udege people, has leased the Bikin Nut Harvesting Zone (NHZ) and riparian zone of Bikin river (subsequently referred to as "concession area" whereas the project area is a part of the concession area) concession from the Forest Department of Primorsky krai[1]. This allows TCT to protect its area of living from any logging activities and thereby ensures the integrity of forest- and carbon stocks in the project area.
The project setup foresees:

- The protection of the project area from any logging operations as well as the conservation of the existing forest carbon stocks.
- The assessment of the development of forest carbon stocks under a) the baseline scenario (i.e. logging) and b) the protection of the project area from logging.
- The calculation of the difference of carbon stocks of baseline and project scenarios.
- The generation of Emission Reduction Units (ERUs) considering above difference of carbon stocks, project emissions and leakage.
- The ERUs shall be sold in the international emission trading market allowing the TCT in the midterm to pay the annual concession fees to the Forest Department of Primoryski krai and to pay for all necessary conservation measures related to the management plan of the concession.

Situation existing prior to the Starting Date of the LULUCF Project. The project area is pristine forest which has not been commercially logged so far. It is classified as Nut Harvesting Zone (NHZ) and as riparian zones by Decisions of the Council of Ministers of the Russian Soviet Federative Socialist Republic in the 1950ies-1970ies. This was done due to the high share of Korean Pine stands, importance for traditional nature use for game and Non Timber Forest Products as well as high ecological functions of the project area.
The project is located in two concession parts, the Bikin NHZ (88% of the total area) and the riparian zone (12% of the total area). Together, the two forest areas sum up to a total area of 461,154 ha. The Bikin NHZ is by far the largest of all NHZs in Khabarovsk and Primorsky Krai, followed by Vostochnaya NHZ with a total area of 95,303ha (Please refer to Annex 2.2 for a complete list of NHZs in above named krais).

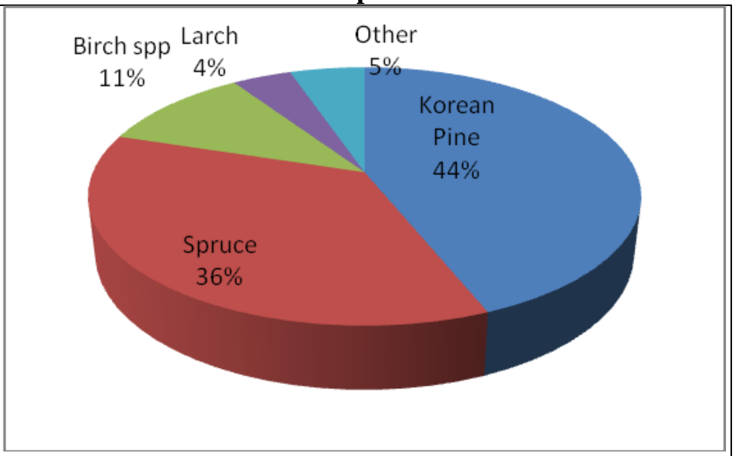
[1] Also referred to as Primorye.

Out of the total area of the concession, 455,593ha are classified as forest. Out of this forest area, several small forest plots are dedicated to fuelwood logging operations. The remainder is subsequently referred to as 'Project Area' (450,374ha). As outlined in Table 1, the project area comprises 43.9% of Korean Pine stands, of which 41% have a Korean Pine share of 30% or more by volume. Other major tree species are Spruce (36%), Birch species pluralis (spp.), (i.e. Stony Birch, Yellow Birch and White Birch), Larch (4%) and other species such as Ash, Elm, Fir, Oak and other. The shares of tree species are illustrated in Figure 1.

Table 1: The Project Area Composition by Dominant Species/Stands

Species	Ha	%
Korean Pine	200.199	43,9
Spruce	164.190	36,0
Birch spp	49.034	10,8
Larch	18.844	4,1
Other	23.935	5,2
Source: Bikin Forest Inventory 2010		

Figure 1: The Project Area Composition by Dominant Tree Species



Source: Forest Inventory Unit, 2010, The project area Inventory

In terms of commercial volume, the project area features a total volume of 101.8 million m^3. Most dominant species by volume is Spruce (26.0 million m^3, 25.6%), Korean Pine (24.0 million m^3, 23.3%), Yellow Birch (14.3 million m^3, 14.3%) and Fir (10.6 million m^3, 10.4%). A complete list of commercial volumes by species is found in below table.

Table 2: Summary of the Project Area Inventory Analysis

Tree Species	Volume	Density	AGB	Carbon Stocks
	in m^3	in t.d.m.	in t.d.m.	in tC
Береза бородавчатая - Comon/White birch	3,032,512	1,546,581	2,010,556	965,067
Береза желтая - Yellow birch	14,411,003	7,349,611	9,554,495	4,586,157
Береза каменная - Stony birch	1,004,381	512,234	665,905	319,634
Дуб – Oak	1,913,558	1,109,864	1,553,809	745,828
Ель – Spruce	26,063,916	10,425,566	14,908,560	7,603,365
Ива – Willow	51,148	23,017	31,763	15,246
Ильм – Elm	3,621,897	1,774,729	2,396,951	1,150,537
Кедр (сосна кедровая) - Korean pine	24,064,021	10,106,889	14,756,058	7,525,589
Клен – Maple	1,323,027	687,974	949,404	455,714
Лиственница – Larch	3,242,301	1,685,996	2,495,275	1,272,590
Липа – Lime	6,587,859	2,305,751	3,112,764	1,494,127
Ольха – Alder	197,525	88,886	122,663	58,878
манчжурский - Manchurian walnut	12,264	6,500	8,970	4,306
Осина – Aspen	793,596	317,438	419,019	201,129
Пихта сибирская – Fir	10,642,090	4,256,836	5,746,729	2,930,832
Тополь – Poplar	401,430	140,501	193,891	93,068
Чозения - Chosenia (lat.)	870,795	391,858	540,764	259,567
Черемуха - Bird Cherry	2,022	991	1,367	706
Ясень обыкновенный – Ash	3,597,341	2,050,485	2,829,669	1,358,241
Sum	**101,832,686**	**44,781,707**	**62,298,609**	**31,040,581**
Primary Source : Bikin Inventory, (2010); The sources for BEF, CF and density factors are indicated in Section B.				

In terms of total carbon stocks, the project area comprises 31.04 million tC or 113.82 million tCO_2, respectively, and average carbon stocks of 68.92tC/ha or 252.71tCO_2/ha.

Table 3: Carbon Stock Summary

Total Carbon Stock of the Project Area (in tC)	31,040,581
Total Carbon Stock of the Project Area (in tCO_2)	113,815,280
Average Carbon Stock per Hectar (in tC/ha)	68.92
Average Carbon Stock per Hectar (in tCO_2/ha)	252.71

Social and Ecological Project Impacts – Climate, Community and Biodiversity. The proposed project features a Climate, Community and Biodiversity (CCB) component. The CCBA is a quality standard for climate forest projects, which ensures that CCB project's feature positive social, and environmental impacts. The proposed involves such a CCB component[2].
The project area is a unique ecosystem being home to at least 12 endangered species (i.e. listed as vulnerable, endangered or critically endangered in the IUCN Red List book). One of these species is the Amur tiger. The tiger population in the Bikin is estimated to 30 to 35 animals. Its primary habitat is rocky Korean Pine – mixed broadleaf forests. Korean Pine stands are also an important ecosystem for the tiger's primary prey (deer and wild boar) through provision of nutrition (such as Korean Pine Nuts, KPN) and shelter functions.

The Bikin is not only home to threatened species, but it is also home for species which are endemic for the Russian Far East (WWF Russia, Amur Branch). There are at least 14 endemic species living in the Bikin. Based on the high endemism and based on being habitat to major endangered species, it is concluded that the Bikin is a unique ecosystem on a regional and global scale.

Figure 2: Amur Tiger - Panthera tigris

Source: Courtesy of Vasily Solin, WWF Russia, Amur Branch

Besides its ecosystem functions the Bikin is also home to indigenous tribe of the Udege. The Udege have been living in the Bikin area for centuries (see "History of social, economical and cultural development of Udege people" by A. Startsev, 2000). They follow a lifestyle which is even today deeply connected to nature which may be connected to the Udege's original belief. In scientific terms, the Udege's spiritual belief is classified as "animism". The Udege believe that they are surrounded by an almost infinite number of nature spirits. So they believe that e.g. each animal and each tree has its own soul. But there is also a vertical hierarchy among these spirits – there are so-called spirits-masters of e.g. rivers, streams, forests, hills, etc. Among these, the important spirits are considered as the ancestors' souls. It is

[2] The project documentation is available at www.climate-standards.org/projects/index.html

concluded that the project area has a high religious and cultural value to the Udege. As far as the biggest Udege population lives here and very depends from the wilds.
In the project area, the Udege have formed an interest group, the Tribal Commune Tiger (TCT) to pursue the economic and social interest of the tribe under an elected leader.

Baseline Scenario. The most plausible baseline scenario is the logging of the project area under intermediate logging and selective commercial logging schemes. For years commercial forestry enterprises have tried to get access to the valuable timber resources of the area. This scenario was verified based on the analysis of past logging attempts as well as on legal analyses.

- Past logging attempts:
  - Already in 1990, Hyundai, a Korean Logging company tried to lease NHZs in the region including the Bikin for commercial logging purposes The company built a sawmill and a harbour in the bay of Svetly. There was substantial commercial interest in the Bikin in view of its commercial wood stocks.
  - The Udege anticipated that such commercial development of the Bikin forest area would have significant negative impacts on their way of living. Hence they strongly fought against the Hyundai initiative to protect their area of living by all means.
  - Ever since, there have been frequent attempts to lease the Bikin NHZ as a timber concession. The last one occurred in 2011, when the Russian company LesExport proposed an investment project in the Northern Primorsky Krai including the lease of a concession close to the Bikin and almost all project area (88%).
- Legal analysis
  - As mentioned above the project area was classified as Nut Harvesting Zone (NHZ) and riparian zone by decisions of the Council of Ministers of the Russian Soviet Federative Socialist Republic in the 1950ies-1970ies. This was done due to the high share of Korean Pine stands in the project area, its importance for traditional nature use for game and NTFP as well as high ecological functions of the project area. Respective regulations prohibited any commercial timber logging activities in the area. Instead, only silvicultural treatments such as **intermediate logging** and other non-commercial forms of logging such as **selective sanitary logging** were allowed with the objective that such silvicultural measures are required to ensure long-term stability and productivity of the forest stands.
  - Following the new Forest Code of the Russian Federation coming into force in 2007, a series of new amendments and regulative decrees, rules and regulations was published by the government affecting the former protected status of the project area, as they foresee a different way of management of the area. Based on the new legislation that was signed on the 6th of November 2009 and came into force on 25th of January 2010 (Russian Forest Code, Articles 102, 106, Order of Ministry of Agriculture of RF № 543 from 06.11.2009), it’s possible to carry out not only intermediate logging or selective sanitary logging in water protective forests, nut harvesting zones, forests near water objects, but also selective commercial logging in mature and over-mature forests. Old-grown forest stands with less than 30% Korean Pine (by volume) making up for 59% of the project area qualify for commercial timber harvesting operations. Starting commercial logging activities in the Bikin area would lead to massive biomass/carbon stock losses within a few years as is shown by examples within the region.
  - The reminder of the area having a Korean Pine share of more than 30% and more is still eligible for intermediate logging and selective sanitary logging. Even foreseen as a measure to improve stand quality, it has proven that commonly applied logging practices applied during these silvicultural measures led to significant carbon stock decreases as can be seen in other NHZs in Primorski Krai and Khabarovsky Krai.
- Economic analysis

- The project area is owned by the state and is administered by the Forest Department of Primorsky Krai. If the project area would not be leased by TCT, the forest department could issue annual felling tickets or logging concessions and generate revenues from stumpage or concession fees. If such felling permissions are not issued, the Forest Department does not realize timber-related revenues from the concession area. In addition, revenues could be obtained from sales of minor forest products such as pine nuts and other NTFP.

Based on the continuous attempts to log the project area as well as on the existing district forest management plan and the change in the legal protection status, it is concluded that very substantial timber logging activities in form of selective commercial logging, intermediate logging and selective sanitary logging would take place in the project area in absence of the project activity.

In order to quantify the logging impacts, the WWF Russia, Amur Branch engaged the Russian Far Eastern Forest Research Institute to determine the logging volumes. While being a state agency, the institute is a well- known and acknowledged research institution. It is entitled to develop forest management plans. The findings of the analysis are presented in below table. The complete analysis is attached in Annex II (Baseline Information).

Table 4: Baseline Logging Area and Volumes for the Concession

Validity		Days	Volume	Area	Merchantable Volume
From	To	d	in m^3/yr	in ha/yr	in m^3/ha
03.06.2009	25.01.2010	236	142,320	3,522	40.41
26.01.2010	31.12.2012	339	399,000	9,287	42.96

- As can be seen in the table above, the logging volume of 143,320 m3/yr was applicable from the project start (3rd June of 2009) up to the 25th January 2010. It was valid for 236 days of the crediting period.
- As can be seen in the table above, the logging volume of 399,000m3/yr was applicable from the 26th January 2010 onwards.
- In order to model the baseline scenario, it was assumed that the rules leading to the lower logging volumes and –areas were in place for one year (i.e. 365 days). This is considered to be conservative.

Legal Logging, TCT is entitled to log some forest stand for fuelwood and to meet the local timber demand. The maximum volume of logging is determined TCT's NTFP the management plan which was approved by the Forest Department of Primorski krai. It allows the TCT to log a maximum volume of 13,756 m3/yr on a total area of 5,254ha over 10 years. The stands, where TCT is allowed to log are identified in Annex 2.4 and a summary is provided in the table below.

Table 5: Legal Logging Parameters

Area	Area	Logging Volume	Logging Volume
in ha	in ha/yr	in m3/yr	in m3/ha
5,254	525	13,756	26
		Discount Factor	0.06

So far the TCT logged only 21,379m3 in total for the years 2009, 2010 and 2011 which equals 8,276m3/yr. This is significantly below the allowed volume and amounts to 2.07% of the baseline logging. The logging sites have been removed from the project area.

The baseline logging area and volume for the concession are calculated and approved for the total concession area, including the sub-compartments, where legal logging may take place. As the legal logging sub-compartments have been removed from the project area, the baseline logging area and volumes have to be adopted.
As can be seen from the table above, baseline logging area amounts to 9,287ha/yr. The legal logging area amounts to 525ha/yr equaling 6%. Hence the baseline logging areas and volumes have been discounted by 6% which results in the values shown in the table below.

Table 6: Baseline Logging Area and Volumes for the Project Area

Validity		Days	Volume	Area	Merchantable Volume
From	To	D	in m^3/yr	in ha/yr	in m^3/ha
03.06.2009	25.01.2010	236	134,270	3,323	40.41
26.01.2010	31.12.2012	339	376,430	8,762	42.96

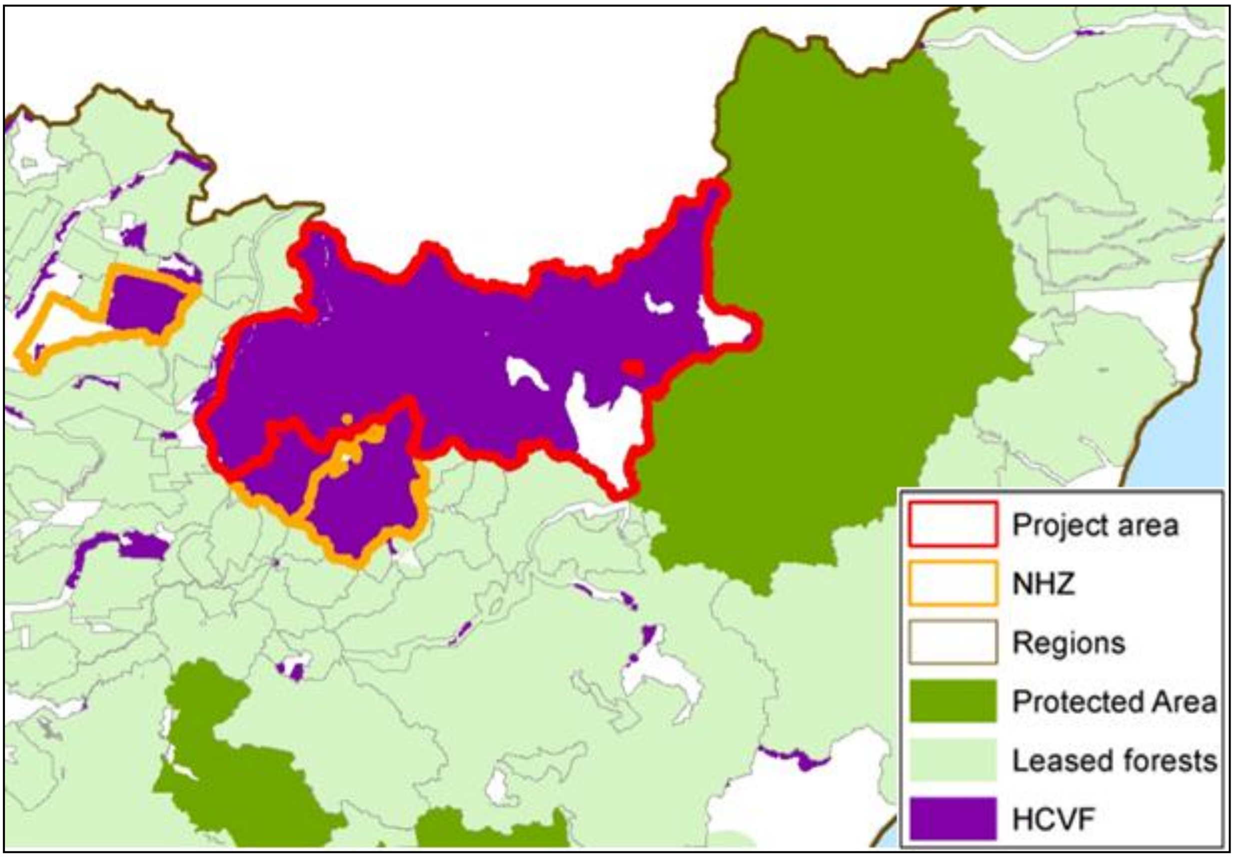
TCT's logging intensity may amount to 26m3/ha whereas the baseline logging may amount to 43m3/ha. Hence the correction by size is found conservative.

The below figure demonstrates the thread of deforestation in the project region. The figure may be interpreted as follows:

- White areas are not leased as forest concession.
- Light green areas are forest concessions
- Dark green areas are classified as 'protect areas' where commercial logging is not allowed according to the forest codex of the Russian Federation.
- Violet areas are classified as High Conservation Value Forests (HCVF) which are classified as mixed broad leaved Korean pine stands, and dark conifer stands. These forests are so far not logged and have a high economical value (please refer to section E.4 for a more detailed interpretation).

Overlapping the HCVF with spatial data of leased forests show, that there are hardly any HCVF which are leased as a logging concession. South-west of the project area (i.e. directly bordering), there is the Vostochnaya Nut Harvesting Zone, which is also leased as a conservation concession (with support from WWF Russia, Amur Branch). In the west of the project area, there lies the Pozharskaya NHZ which is currently leased for selective commercial logging.
The figure also shows that all forest areas, also more remote areas in the south, in the East and North East are subject to commercial logging (excluding protected areas).

Figure 3: Logging Activities in the Project Region



Source: Figure developed by WWF Russia, Amur Branch. The figure was developed based on three GIS layers: A) HCFV layer was developed based on WWF Russia's HCFV assessment[3]. B) Leased area layer, developed by WWF Russia, based on the publication of auctions for forest concessions by the Forest Department of Primorye. C) Protected Areas layer based on the publication of the delineation of Protected Areas.

Project Scenario. The Tribal Commune Tiger will lease the project area and thereby protect the land from logging. At the 3rd June 2009, the Tribal Commune Tiger leased the Bikin concession from the Primorsky Forest Department with the objective to protect the area against logging (Contract of Forest Lease No. 4/34). The concession contract explicitly grants the Tribal Commune Tiger the right to develop an emission reduction project. The concession lease period is 49 years. It is concluded that the project activity protects the project area from logging until 2058.
The protection of the project area will conserve the forest stands and avoid the decrease of respective wood volumes - and related - the decrease of forest carbon stocks.

But the project will also produce emissions. These emissions will arise from subsequent activities:

- Natural disasters such as forest diseases and fires may reduce the carbon stock under the project scenario. The integrity of forest stands will be monitored. If a natural disaster is detected, the related decrease of forest carbon stocks will be accounted for under the project scenario.
- Even though WWF has a team of forest guards patrolling the project boundary on behalf of TCT, illegal logging may occur. The project will monitor the integrity of forest stands. If illegal logging is monitored, the related decrease of forest carbon stocks will be determined and accounted for under the project scenario.

[3] Report avialable at: hwww.globalforestwatch.org/english/russia/pdf/HCVF.pdf

History of the LULUCF Project. The subsequent section outlines the history of the LULUCF project.

- In April 2007, an EU TACIS project was started as the first financial support to the region, supporting the indigenous communities in maintaining their traditional lifestyle including hunting, fishing, trapping, carpentry, handicrafts and setting up simple ecotourism structures. The support also included legal advice to maintain the indigenous rights to the area, and planning for the establishment of a TTNU, all for preventing logging companies from leasing the area.
- Building upon the established partnership with the Tribal Commune Tiger (TCT), a project concept was developed in 2008 by WWF Russia, WWF Germany and TCT to lease 461,500 ha of a forest massif with virgin temperate coniferous broadleaved forest as conservation concession for 49 years, as a strategy for carbon conservation within the framework of the International Climate Protection Initiative (section: "Securing natural carbon sinks and habitats of special significance for adaptation to the consequences of climate change"). For the first time, carbon finance was considered as a means to secure the long-term lease payments.
- In May 2008, WWF Germany applied for financial support from the German Ministry of Environment (BMU) under its international climate change initiative (BMU ICI); the project was accepted and officially started in September 2008. During the inception period the project focused on preparing and lobbying for the land concession, hiring appropriate project staff and assessing the climate relevance of the project through a feasibility study. BMU ICI funding (three years) was used as seed funding to secure the concession and making the first three payments, and to establish the JI project.
- To this end, the carbon consulting company Ecosecurities was hired in February 2009 to assess the feasibility of the project as a forest carbon project. The project was evaluated as feasible, and the JI mechanism recommended as the most promising commercialization option. A final report was created in April 2009.
- In June 2009, the concession for harvesting non-timber-forest products was finally given to WWF's partner, the Tribal Commune Tiger, and the respective contract was signed on June 3rd 2009, explicitly granting the TCT the right to claim carbon certificates for the protection of the project area. After a long and intensive dispute with the forest department about opening any auction for nut harvesting zones, this was a major success and milestone for the project. It will protect the area from any commercial logging activities, provided that financial sustainability, i.e. annual payment of concession fees, can be secured.
- After conducting an international tender process (end 2009/beginning 2010), WWF contracted GFA ENVEST for the development of the Project Design Document (PDD) and for assisting with the determination of the project and commercialization of the carbon credits.
- The project is being implemented by TCT and WWF Russia with the technical guidance of WWF Germany for the development of the forest carbon component.

A.3. Project participants:

Name of Party involved (*)	Legal entity / project participant (as applicable)	Party* involved wishes to be considered as project participant (Yes/No)
Russian Federation*	Tribal Commune Tiger	No
France	CF Partners (UK) LLP	No
* (host) indicates a host Party		

A.4. Technical description of the LULUCF project:

A.4.1. Location of the LULUCF project:

A.4.1.1. Host Party(ies):

Russian Federation

A.4.1.2. Region/State/Province etc.:

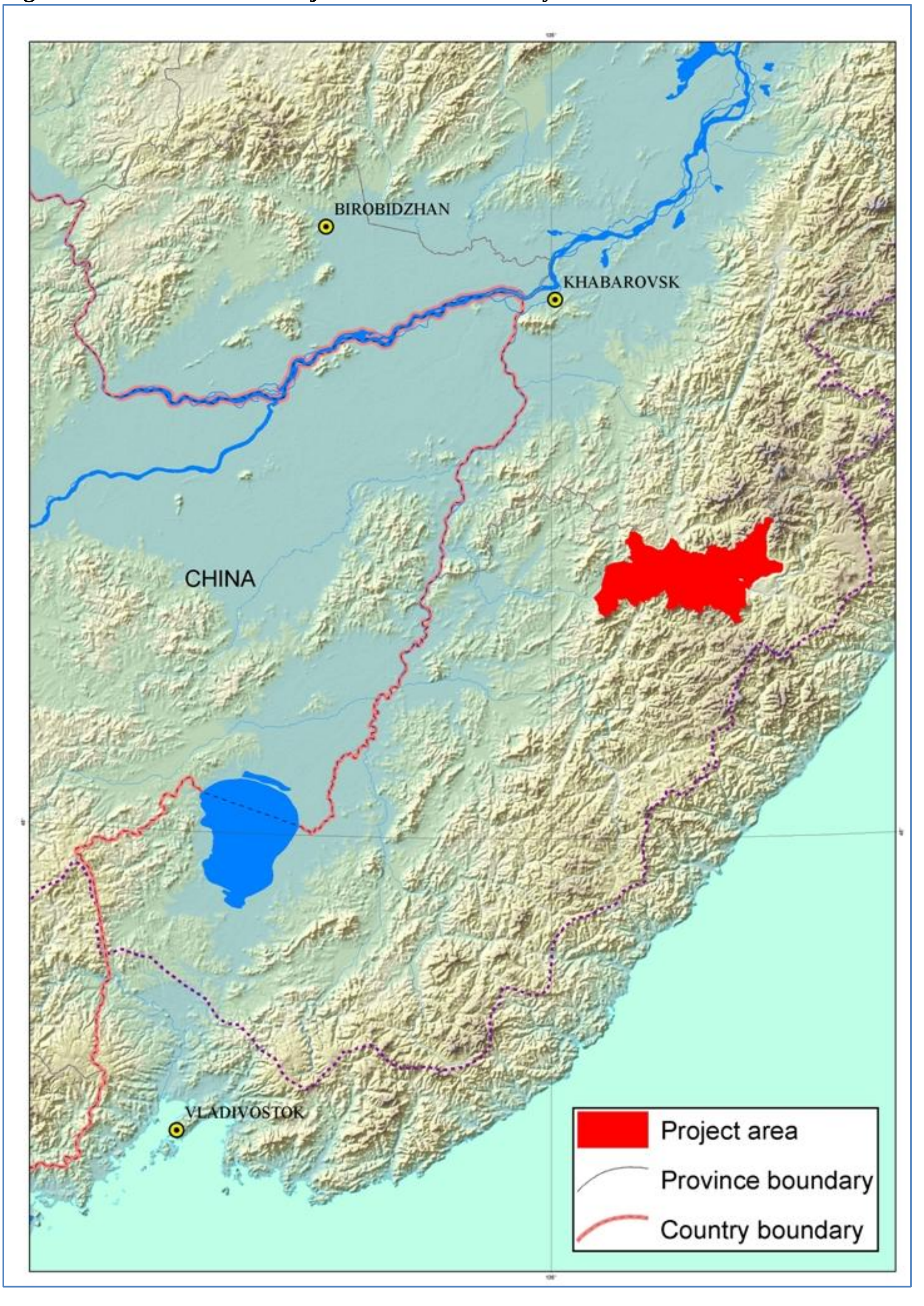
The project is located in Primorsky Krai. Primorsky Krai is located in the Southern Far East of Russia bordering China and North Korea. The exact location of Primorsky Krai is shown in below figure (area marked red).

Figure 4:Location of Primorsky Krai

A.4.1.3. City/Town/Community etc.:

The project is located north to the settlement of Vostok and east to the village of Krasny Yar.

Figure 5: Location of the Project Area in Primorsky Krai



A.4.1.4. Detailed delineation of the project boundary including information allowing the unique identification of the LULUCF project:

The project boundary is delineated by the outer boundary of the Bikin NHZ and the riparian zone comprising the project area. The concession has a total area of 461,154 ha, located in the Pozharsky District, Verkhne-Perevalnenskoe Forestry Unit:

- Sobolinoe Divisional Forestry (compartments 68, 107-117),
- Krasnoyarovskoe Divisional Forestry (compartments 118-308, 326-337, 342-407, 409, 413, 417),
- Okhotnichie Divisional Forestry (compartments 309-325, 338-341, 408, 410-412, 414-416, 418-523, 525-530, 537-543, 549-563, 571-575, 589, 590, 593, 594, 598-603, 611-620, 626, 627, 632-656, 663-666, 701-713, 715-717, 719).

The number of the record on the state forest register is 20/1105006-2009-03. Below map illustrates the location of the compartments within the divisional forest units.

Legend for Figure 5

The boundary of the Project Area

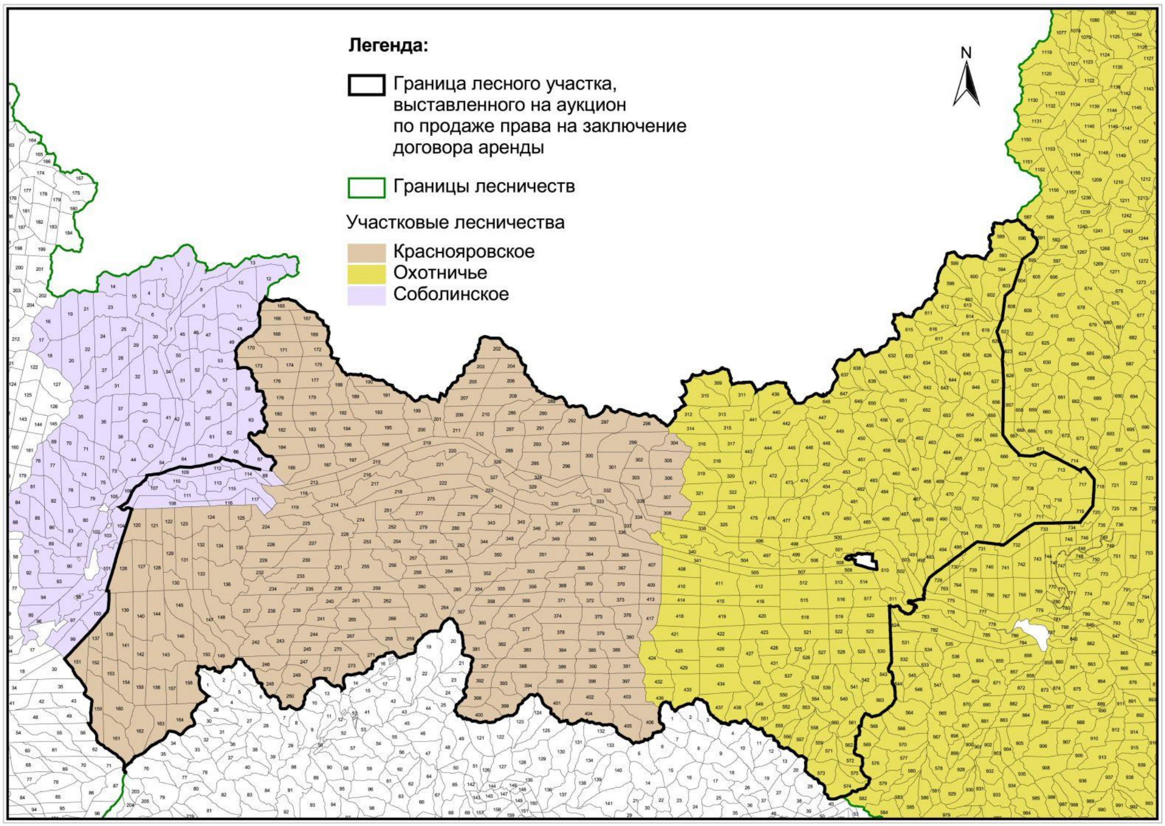
Boundaries of forest units

Krasnoyarovskoye Divisional Forestry

Okhotnichie Divisional Forestry

Sobolinskoye Divisional Forestry

Figure 6: Project Boundary and Location of Compartments by Divisional Forestries



In general, the project boundary is illustrated by the black line surrounding the Bikin Nut Harvesting Concession. Within the area of the forest concession, there are some sub-compartments which do not qualify as forest, according to the Forest definition of the Russian Federation (total area: 5,556ha, see Section A.4.2 below). These are excluded from the project area, through they are included in the concession area. Finally, TCT envisages logging fire wood and timber for the demand of the local villages. To meet this demand, logging sites have been specified in TCT's NTFP management plan (total area 5,224ha). These areas are not included in the project area, though they are part of the concession area. This approach results in project area of 450,374 ha.

Table 7: Definition of the Project Area

Concession Area (in ha)	461,154
Non-Forest Area (in ha)	5,556
Forest Area (in ha)	455,598
Legal Logging Area (in ha)	5,224
Project Area (in ha)	**450,374**

Exact GPS positions of all points of the project boundary, as requested by the applied methodology, may be provided to the AIE upon request.

A.4.2. Conformity with the definitions of LULUCF activities:

The host party (Russian Federation) has decided on the following Kyoto forest definition and elections for Article 3, paragraphs 3 and 4, activities in accordance with decision 16/CMP.1[45]:

- A single minimum tree crown cover value of 18% (equivalent to 30%[6] stocking density)
- A single minimum land area value of 1.0 hectare
- A single minimum tree height value of 5 meters

Additionally, a minimum value of forest width of 20 meters applies.

Russia accounts it emissions from sinks and sources for afforestation, reforestation and deforestation (Article 3.3 of the Kyoto Protocol). Moreover Russia elected to account for sinks and sources from forest management under Article 3.4. Russia will account for the chosen LULUCF sinks and sources annually.

Following above definitions, the concession area was compiled by:
- Excluding all sub-compartments having a stocking density below 30% (633 sub-compartments, 5,260.9 ha)
- Excluding all sub-compartments having a maximum height below 5 m (660 sub-compartments, 5,462.2 ha)
- Excluding all sub-compartments having a minimum area below 1 ha (243 sub-compartments with a total area of 124.7ha).

Eliminating the above areas (which are partially overlapping) from the concession area defines the forest area, which amounts to 455,593 ha. This area fulfills all of the above criteria and hence qualifies as forest

[4] Taken from the first national and the current (I.e. 16th March 2010) communication of the Russian Federation to the UNFCCC. Available under:

- www.unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/pdf/initial_report_russia.pdf
- www.unfccc.int/resource/docs/natc/rus_nc5_resubmit.pdf

[5] Report of the review of the initial report of the Russian Federation. UNFCCC/IRR/2007/RUS of 18.02.2008.

[6] Taken from the first national communication of the Russian Federation to the UNFCCC.

according to the forest definition of the Russian Federation and falls under the elected activity chosen by the Russian Federation.

VCS Forest Definition. Additionally to the Kyoto forest definition of the Russian Federation, applied above, the project area complies with the VCS forest requirements for REDD+ and IFM projects. As stipulated in the VCS Requirements (§4.2.3, page 17 and §4.2.5, page 19) an IFM project activity may be implemented only on those areas that qualify as 'forests remaining as forests' as set out by FAO and IPCC. In this regard, the project area must have qualified as forest, 10 years before the project start date. The project area qualified as forest ten years prior to the project start date. This was verified by a GIS analysis. The following steps were conducted:

- The shape file of the concession area showing all compartments and sub-compartments was used as basis for the analysis.
- The shape file was complemented with the new inventory data. The inventory data also provides information on the age of sub-compartments as determined during the conduction of the inventory.

The analysis of the data set shows that there are 0ha with an age of less than 15 years in the project area. This analysis can be shown to the AIE upon request. Consequently, the forest was forest 10 years prior to the project start.

A.4.3. Technology(ies) to be employed, or measures, operations or actions to be implemented by the LULUCF project:

By declaring the forest as conservation forest, the extraction of timber with accompanying trees and soil damages and the release of carbon emission will be avoided for the time of the project period. There is no further specific technology applied.

A.4.4. Brief explanation of how the net anthropogenic removals by sinks are to be enhanced by the proposed JI LULUCF project, including why these enhancements would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

The net anthropogenic GHG removals by sinks will be enhanced by allowing the original Bikin forest to continue storing carbon instead of being removed and forced to regenerate from scarce natural seedlings. Moreover specifically, net anthropogenic removals by sinks are calculated as follows:

- $C'_{degradation,t}$ comprise the baseline emissions due to carbon stock decreases, emissions due to the decay of long term harvesting wood products (ltHWP), emissions due to the decay of deadwood, as well as re-growth which would occur in the baseline case after logging operations. The key parameters, the annual allowable cut, and the annual net harvesting area were determined by the federal budgetary institution 'Far Eastern Forest Research Institute (FFRI)'. According to the Russian forest legislation, the FFRI is entitled to develop forest management plans. The calculation of FFRI was confirmed by the head of the forest department of Primorski Krai, Mr. Rybnikov. The calculation itself is provided in Annex 2.1. The Russian and the English translation are provided in Annex 2.3.
- $C'_{emissions,t}$ comprise the baseline emissions due to logging operations, including emission from harvesting, hauling, transport, and processing.
- $C'_{actual,t}$ comprise the project emissions including emissions from illegal logging operations and the degradation of forest stands due to natural disturbances (pests and fire).
- Finally the project accounts for leakage. As leakage due to activity shifting may not take place, leakage comprises only market leakage.

Below table presents the anticipated net anthropogenic removals by sinks for the first ten years of the project activity:

Table 8: Anticipated Net Anthropogenic Removals by Sinks					
Year t	$C'_{degradation,t}$ (In tCO2)	$C'_{emissions,t}$ (In tCO2)	$C'_{actual,t}$ (In tCO2)	**Leakage** In tCO2	**Net Anthropogenic Removals by Sinks** (In tCO2)
1	94,657	1,839	817	18,931	76,748
2	227,614	5,157	817	45,523	186,432
3	229,367	5,157	817	45,873	187,834
4	230,350	5,157	817	46,070	188,621
5	230,607	5,157	817	46,121	188,826
6	228,764	5,157	817	45,753	187,351
7	223,959	5,157	817	44,792	183,507
8	218,538	5,157	817	43,708	179,171
9	212,537	5,157	817	42,507	174,370
10	205,985	5,157	817	41,197	169,129

A.4.4.1. Estimated enhancements of net anthropogenic removals by sinks over the crediting period:

Following the Russian JI procedures, the project applies a crediting period from 3rd June 2009 up to 31st December 2012. If a follow up agreement to the Kyoto Protocol is ratified, this may eventually be revised.

Table 9: Net Anthropogenic Removals by Sinks over the Crediting Period	
Crediting Period:	3 Years, 7 Months
Year	Ex-ante Estimate of Annual Enhancements of Net Anthropogenic Removals by Sinks (in t CO_2e)
Year 1 (3rd June 2009 to 2nd June 2010)	76,748
Year 2 (3rd June 2010 to 2nd June 2011)	186,432
Year 3 (3rd June 2011 to 2nd June 2012)	187,834
Year 4* (3rd June 2012 to 31st December 2012)	109,555
Total Estimated Enhancements of Net Anthropogenic Removals by Sinks over the Crediting Period (in tCO_2e)	560,569
Annual Average of the Enhancements of Net Anthropogenic Removals by Sinks over the Crediting Period (in tCO_2e)	156,438

*Please note, as the project start was 3rd June 2009. Hence year 4 comprises the emission reductions from 3rd June 2012 up to the end of the crediting period (31st December 2012).

In line with the JI Glossary, the proposed project will moreover generate emissions reductions after the end of the first commitment period, if the Russian Federation decides to participate in such. In case this will apply, the ex ante estimate for the period after the first commitment period is presented in the below table.

Net Anthropogenic Removals by Sinks after the 1st Crediting Period	
After the 1st Crediting Period:	6 Years, 5 Months
Year	Ex-ante Estimate of Annual Enhancements of Net Anthropogenic Removals by Sinks (in tCO2e)
Year 4** (1st January 2013 to 2nd June 2013)	79,066
Year 5 (3rd June 2013 to 2nd June 2014)	188,826
Year 6 (3rd June 2014 to 2nd June 2015)	187,351
Year 7 (3rd June 2015 to 2nd June 2016)	183,507
Year 8 (3rd June 2016 to 2nd June 2017)	179,171
Year 9 (3rd June 2017 to 2nd June 2018)	174,370
Year 10 (3rd June 2018 to 2nd June 2019)	169,129
Total Estimated Enhancements of Net Anthropogenic Removals by Sinks over 10 Years (in tCO2e)	1,721,989
Annual Average of the Enhancements of Net Anthropogenic Removals by Sinks over 10 Years (in tCO2e)	172,199

** Year 4 comprises the emission reductions from the 1st January 2013 up to the 2nd June 2013.

A.5. Project approval by the Parties involved:

Written approvals of both parties involved will be attached to the JI PDD after successful determination and issuance of Letters of Approvals.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

Step 1: Indication and Description of the Approach Chosen. The identified baseline is intermediate- and selective commercial logging in the project area. The approach for the identification of the baseline is described in detail in Section B4, Step 1-4, pages 23 – 32. The baseline for the proposed JI project activity was defined in accordance with the JISC Guidance on criteria for baseline setting and monitoring (Version 02). It classifies as a 'JI specific approach'.
Reference is made to the baseline & monitoring methodology "Estimating GHG Emission Reductions from Planned Degradation (Improved Forest Management)[7]" developed under the Verified Carbon Standard (VCS). The methodology is available under the below link:

- www.v-c-s.org/methodologies/VM0011

Prior to being registered by the VCS, any VCS methodology must undergo a two phased validation process. The first and second VCS methodology assessment report may under the following link:

- www.v-c-s.org/sites/v-c-s.org/files/VM0011%20Second%20Assessment%20Report.pdf
- www.v-c-s.org/sites/v-c-s.org/files/VM0011%20First%20Assessment%20Report.pdf

Please note, the VCS methodology allows for considering 'positive leakage'. These emissions are directly attributable to the project activity, occur outside of the project boundary and increase the volume of emission reductions. JISC's Guidance of Criteria for Baseline Setting and Monitoring (JISC18, Version 02) explicitly constrain leakage for Land Use, Land Use Change and Forestry (LULUCF) to 'negative leakage'8. The proposed project determines the volume of these types of emissions but does not include these in the calculation of emission reductions. This was done to ensure consistency with JI rules and procedures and is considered to be conservative.

This methodology was applied, as the CDM is restricted to Afforestation/Reforestation and hence does not cover Forest Management as stipulated under Article 3.4 of the Kyoto Protocol. Consequently, there is no applicable CDM methodology.

Step 2: Application of the Approach Chosen. Complementing above methodology, the following tools and guidelines were applied:

- Tool for testing significance of GHG emissions in A/R CDM project activities, Version 1, CDMEB 31,
- Tool for the demonstration and assessment of additionality in A/R CDM project activities, Version 2, CDM EB35, Annex 17.
- Tool for testing the significance of GHG emissions in A/R CDM project activities, Version 1, CDM EB 31,
- VCS Agriculture, Forestry and Other Land Use (AFOLU) Requirements[9], Version 3.2,
- Guidance of Criteria for Baseline Setting and Monitoring, JISC18, Version 02;

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[7] Downloaded at 27th October 2011 from www.v-c-s.org/methodologies/VM0011

[8] JISC18, §17 stipulates: "Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and is directly attributable to the JI project. In the case of JI LULUCF projects, only the increased anthropogenic emissions by sources and/or reduced."

[9] Downloaded at the 13th February 2012 from www.v-c-s.org/program-documents/afolu-requirements-v30#overlay-context=program-documents

The project meets the methodology's following applicability criteria:

Table 10: Methodology Applicability Criteria	
Criteria	Description
Project type	The project qualifies as an Improved Forest Management – Logged to Protected Forest project activity. There will be no commercial logging in the project activity.
Condition of the forest	The project area qualifies as intact (i.e. un-logged) forest. Forest located in the project area is forest since more than ten years. The evidence for intactness is provided to the AIE by remote sensing images from 1999 or earlier and by the forest inventory of 1992. The age class of forest stands is also documented in the forest inventory of 2010.
Forest Product Type	The project accounts for harvested wood products (HWP) as emission source, though considered as pool under VCS.
Driver of Degradation	Legally sanctioned timber harvest.
Project Proponent	The Tribal Commune Tiger (TCT) has the control and responsibility for the IFM-LtPF project activity. TCT has leased the concession from the Primorski Forest Department for 49 years.
Baseline Activity to be Displaced	Commercial logging for timber production.
Project Area	▪ The project area qualifies as a Nut Harvesting Zone (NHZ). NHZs are designed for complex forest use combining harvest with Non-Timber Forest Product (NTFP)-use. As such NHZs are designated and sanctioned for selective logging. ▪ The project provides approved documents, which specify the geographical boundary of the project area. ▪ The project proponent applies the methodology to a single parcel of land.
Greenhouse Gases (GHGs) Considered	▪ Carbon Dioxide (CO_2) is the principal sink/source. ▪ As the carbon pool soil is conservatively neglected, Nitrous Oxide (N2O) fluxes from/to soils not accounted for. ▪ Still N2O is accounted for in the context of emissions from fuel consumption and for forest fires under the project case. ▪ As the carbon pool soil is conservatively neglected, methane (CH4) fluxes from/to soils not accounted for. ▪ Still CH4 is accounted for in the context of emissions from fuel consumption and for forest fires under the project case.
Carbon Pools Considered	The following carbon pools are considered ▪ Above Ground Biomass ▪ HWP as emission source, though consider as pool under VCS. ▪ Deadwood (DW)
Carbon Pools Not Considered	The following carbon pools are not considered ▪ Below Ground Biomass (BGB) ▪ Soil Organic Carbon (SOC) ▪ Litter

The project does not meet the methodology's following applicability criterion:

Table 11: Methodology Applicability Criteria	
Criteria	Description
Type of Forest	The methodology is restricted to tropical forests. Following FAO 1998[10], this comprises Evergreen Tropical Rainforests and Moist Deciduous Tropical Forests with an annual rainfall ranging from 1,000 to 2,500mm. The project area comprises mixed broadleaf and conifer forests. Annual rainfall in Primorsky Krai ranges from 600 to 850 mm. Climate is classified as 'monsoon influenced humid continental climate' (Köppen climate classification) with sub-tropical summers (average temperature in August amounts to 20.6°C) and cold continental winters (average temperature in January decreases to -13.2°C). Consequently the forest does not qualify as tropical forest. This deviation from the methodology was taken into account by choosing applicable default values of forest operations in temperate forests, or calculating actual values wherever required.

B.2. Carbon pools selected:

According to the methodology applied and in consistency with the VCS AFOLU Requirements[11], above living biomass and dead wood carbon pools are included. All other carbon pools have been conservatively disregarded (see table below).

Table 12: Selected carbon pools		
Carbon pools	Selected	Justification / Explanation of choice
Above ground biomass (AGB)	yes	Above ground tree biomass is the most important carbon pool to be saved from logging operations
Below ground biomass (BGB)	No	Unlikely to decrease due to the project activity or to increase due to the baseline case. Hence BGB is conservatively neglected.
Dead wood (DW)	yes	Following the applied methodology, the proposed project includes Deadwood. Accounting of deadwood and related emissions is constraint to changes due to logging operations. It does not consider the (existing) deadwood which is not related to logging operations. The (existing) Deadwood carbon pools and related emissions can be conservatively disregarded because they are on average always larger in old growth preserved forests (project case) than in managed forests with regular harvesting operations (baseline)
Litter	no	Litter carbon pools can be conservatively disregarded for the same reason as deadwood.
Soil organic carbon (SOC)	no	Soil organic carbon pools are equally larger in preserved old growth forests because after logging operations, a period of mineralization diminishes the soil carbon. This development is not overcompensated by the growth of seedlings (and their input in SOC) after logging. Therefore the soil organic carbon pool is conservatively disregarded.

[10] FAO 1998, Guidelines for the Management of Tropical Forests - The Production of Wood. Available at: WWW.FAO.ORG/DOCREP/W8212E/W8212E00.HTM

[11] VCS, 2011, Agriculture, Forestry and Other Land Use (AFOLU) Requirements. Available at http://www.v-c-s.org/docs/AFOLU%20Requirements%20-%20v3.0.pdf

Neglecting of deadwood, BGB, SOC and litter is considered as conservative. It is understood that the BGB decreases due to logging as the rootstock dies after harvest and slowly decomposes. Young stands have a smaller root stocks and hence the BGB volumes are smaller in young stands than in old-grown stands Caroll and Milakovsky (2010, p286).
Similar, it is also understood, that commercial logging operations do not remove deadwood from the project boundary, as the logging operation follows a commercial interest. Kovalev (2011) conducted a detailed study comparing deadwood prior and after logging operations for the project region. It shows that the deadwood after logging increases significantly after logging operations.

More challenging questions are related to the impacts of logging on the SOC and litter. Caroll and Milakovsky conduct a comprehensive literature review in '*Managing Carbon Sequestration in Temperate and Boreal Forest*s', published in *Forests and Carbon: A Synthesis of Science, Management, and Policy for Carbon Sequestration in Forests* (2010) by Tyrrell, Ashton, Spalding, and Gentry, (Eds).

- Jandl et al. (2007)[12] found that forest floor carbon declined with increasing thinning intensity in field studies in New Zealand, Denmark, and the USA. However, the impact was moderated by the addition of logging slash to the litter layer, and the fairly rapid return to pre-treatment temperatures in all but the most intensively-thinned plots.
- Increases in CO2 efflux after thinning have been observed for several years in California mixed conifers and Ozark oak-hickory (Quercus-Carya) stands (Concilio et al., 2005[13]).
- Some increase in soil respiration was observed after thinning in Norway spruce, but no significant effects on soil carbon storage could be detected with increasing thinning intensity (Nilsen and Strand, 2008[14]).
- Thinning in South Korean forests of Japanese red pine (Pinus densiflora) and German European beech (Fagus sylvaticus) produced no significant increases in respiration (Dannenmann et al., 2007[15]; Kim et al., 2009[16]).

Caroll and Milakovsky hence conclude 'Thinning thus produces a short term decrease in vegetative and litter carbon pools, and little to no increase in soil respiration'. Based on these findings it is concluded that the neglecting of BGB, SOC and litter is conservative.

B.3. Specification of the greenhouse gas sources whose emissions will be part of the LULUCF project:

According to the methodology, the following GHG sources are included or have been conservatively disregarded (see Table 13).

[12] Jandl, R., Linder, M.,Vesterdal, L., Bauwens, B. Baritz, R.,Hagedorn, F., Johnson,D.W., Minkkinen, K., Byrne, K.A., 2007. How strongly can forest management influence soil carbon sequestration? Geoderma 137, 253-268.
[13] Concilio, A., Ma, S.Y., Li, Q.L., LeMoine, J., Chen, J.Q., North, M., Moorhead, D., Jensen, R., 2005. Soil respiration response to prescribed burning and thinning in mixed-conifer and hardwood forests. Canadian Journal of Forest Research 35, 1581- 1591.
[14] Nilsen, P., Stand, L.T., 2008. Thinning intensity effects on carbon and nitrogen stores and fluxes in a Norway spruce (Picea abies (L.) Karst.) stand after 33 years. Forest Ecology and Management. 256, 201-208.
[15] Dannenmann, M., Gasche, R., Ledebuhr, A., Holst, T.,Mayer, H., Papen, H., 2007. The effect of forest management on trace gas exchange at the pedosphere-atmosphere interface in beech (Fagus sylvatica L.) forests stocking on calcareous soils. European Journal of Forest Research 126, 331-346.
[16] Kim, C., Son, Y., Lee,W., Jeong, J., & Noh, N. 2009. Influences of forest tending works on carbon distribution and cycling in a Pinus densiflora S. et Z. stand in Korea. Forest Ecology and Management (257), 1420-1426.

Table 13: Emissions Sources Included in or Excluded from the Project		
Source	GHG	Included / excluded
Baseline Emissions		
Forest Degradation	CO_2	Yes, included as stock change in carbon pools.
Fossil Fuel Use in Machinery	CO_2	Yes, included if emissions occur in the project area.
Electricity Consumption	CO_2	No, as emission occurs outside of the project boundary.
Forest Fires	CO_2, CH_4 and N_2O	Forest fires are conservatively not considered under the baseline case
Commercially Harvested Fuelwood	CO_2	Yes, included in the baseline
Fuelwood gathered for Domestic Use	CO_2	Not included, there are no logging areas in the project boundary.
Biomass Burning in the Course of Land Use Conversion	CO_2, CH_4 and N_2O	Not included in the baseline scenario, conservatively neglected.
Pestilence	CO_2	Not included in the baseline scenario, conservatively neglected.
Project Emissions		
Electricity Consumption	CO_2, CH_4 and N_2O	Not included based on the A/R-CDM 'Tool for testing the significance of GHG emissions in A/R CDM project activities'
Flights	CO_2	Not included based on the A/R-CDM 'Tool for testing the significance of GHG emissions in A/R CDM project activities'
Ground Travel	CO_2, CH_4 and N_2O	Not included based on the A/R-CDM 'Tool for testing the significance of GHG emissions in A/R CDM project activities'
Aerial Surveillance	CO_2	Not included based on the A/R-CDM 'Tool for testing the significance of GHG emissions in A/R CDM project activities'
Natural Disturbances	CO_2, CH_4 and N_2O	Included

B.4. Description of how the net anthropogenic removals by sinks are enhanced above those that would have occurred in the absence of the JI LULUCF project:

The latest version of the CDM A/R additionality tool was applied (version 2.0, following CDM EB 35, §17). The steps as outlined in the tool[17] are followed to demonstrate that the proposed JI project activity is additional and not the baseline scenario.

STEP 0: Preliminary screening based on the starting date of the project activity

Evidence of Project Start. The proposed JI LULUCF activity started at the 3rd June 2009 which is the lease date of the concession, i.e the date, when TCT signed the concession contract with the Forest Department of Primorski krai.

[17] Source: http://cdm.unfccc.int/Reference/tools/ar/methAR_tool01_v02.pdf

The project area is forest according to the host country's definition of forest, which is documented in section A.4. Evidence may be provided to the AIE in form of an undersigned concession contract between Mr. Dijuk, Head of Primorski Forest Department and Mr. Shirko, Head of the TCT.

Evidence of the Consideration of Carbon Revenues. From its very beginning, the protection of the project area was envisaged to be implemented as a forest climate project. This may be proven to the AIE in the course of determination by above mentioned contract. The concession contract between Forest Department and TCT also refers to climate and carbon finance issues.

History of the LULUCF Project. The subsequent section outlines the history of the LULUCF project.

- In April 2007, an EU TACIS project was started as the first financial support to the region, supporting the indigenous communities in maintaining their traditional lifestyle including hunting, fishing, trapping, carpentry, handicrafts and setting up simple ecotourism structures. The support also included legal advice to maintain the indigenous rights to the area, and planning for the establishment of a TTNU, all for preventing logging companies from leasing the area.
- Building upon the established partnership with the Tribal Commune Tiger (TCT), a project concept was developed in 2008 by WWF Russia, WWF Germany and TCT to lease 461,500 ha of a forest massif with virgin temperate coniferous broadleaved forest as conservation concession for 49 years, as a strategy for carbon conservation within the framework of the International Climate Protection Initiative (section: "Securing natural carbon sinks and habitats of special significance for adaptation to the consequences of climate change"). For the first time, carbon finance was considered as a means to secure the long-term lease payments.
- In May 2008, WWF Germany applied for financial support from the German Ministry of Environment (BMU) under its international climate change initiative (BMU ICI); the project was accepted and officially started in September 2008. During the inception period the project focused on preparing and lobbying for the land concession, hiring appropriate project staff and assessing the climate relevance of the project through a feasibility study. BMU ICI funding (three years) was used as seed funding to secure the concession and making the first three payments, and to establish the JI project.
- To this end, the carbon consulting company Ecosecurities was hired in February 2009 to assess the feasibility of the project as a forest carbon project. The project was evaluated as feasible, and the JI mechanism recommended as the most promising commercialization option. A final report was created in April 2009.
- In June 2009, the concession for harvesting non-timber-forest products was finally given to WWF's partner, the Tribal Commune Tiger, and the respective contract was signed on June 3rd 2009, explicitly granting the TCT the right to claim carbon certificates for the protection of the project area. After a long and intensive dispute with the forest department about opening any auction for nut harvesting zones, this was a major success and milestone for the project. It will protect the area from any commercial logging activities, provided that financial sustainability, i.e. annual payment of concession fees, can be secured.
- After conducting an international tender process (end 2009/beginning 2010), WWF contracted GFA ENVEST for the development of the Project Design Document (PDD) and for assisting with the determination of the project and commercialization of the carbon credits.

Box: Background to Logging Operations in Primorski Krai
There are three general classes of logging operations, namely: commercial logging, intermediate logging and sanitary logging. **Commercial Logging.** Commercial logging activities are logging targeted to wood harvesting and take place in mature and over-mature forest stands. Forest code defines wood harvesting as an entrepreneurial activity involving cutting of forest stands, skidding, partial processing, storage and transportation of the wood from the forest. This class of logging operation includes selective and clear cuttings. ▪ *Selective Logging.* By the Forest code selective logging of forest stands is the partial removal of trees and

shrubs from respective lands or parcels of land (i.e. forest lands). It can be divided by intensity and by types. Generally selective cuttings are used for cuttings in multi-layered and/or multi-species and/or uneven aged stands, or in protective areas, where clear cuttings cannot be applied.

- *Clear Cuts.* According to the Forest Code clear-cutting denotes removal of forest stands from respective lands or parcels of land (forest lands), with leaving of individual trees and shrubs (groups of trees and shrubs) to grow to ensure regeneration of the forests. Citizens and legal entities shall harvest wood under lease agreements for forest parcels, in exceptional cases for providing state or municipal needs wood can be harvested based on sell-purchase contracts.

Sanitary Logging. Sanitary loggings are loggings targeted to improve forest health – removal of dead and damaged (by pests, fires, so on) forest stands. Conducted by leaseholders.

Intermediate Logging. Intermediate logging aims at increasing the productivity of forests (more specifically to "improve" species compositions and quality of forest stands and to increase their resilience) while maintaining their ecological functions. Intermediate logging takes place in forest stands of any age. It shall be conducted by persons which use forest on the base of forest management plan, or by state or local authorities. Depending on the age of the forest stands, intermediate loggings is divided into following types:

- *Pre-commercial thinning* (In Russian: "Осветление"): targeted to improve species composition and quality of plantations and to improve growing conditions of target tree species.
- *Late pre-commercial thinning* (In Russian: «Прочистка») *:* targeted to regulate density of young stands, to improve growing conditions of target species, and continuing to improve species composition and quality of plantations.
- *Thinning in young and middle-aged stands* (In Russian: «Прореживание»)*:* targeted to forming of steam and crown of trees;
- *Thinning in middle-aged stands* (In Russian: «Проходная рубка»)*:* targeted to improving of growing conditions to increase trees' increment.
- *Renewal cuttings*(In Russian: «Рубка обновления»)*::* are cuttings in maturing, mature and over-mature forest stand targeted to improving the growing conditions for young, high quality trees that are in the stand.
- *Reforming cutting* (In Russian: «Рубка переформирования»)*:* are cuttings that take place in middle-aged and elder forest stands to radical changing of species composition and structure by improving of growing conditions for target species, forest layers, and/or generations.
- *Forming of landscape cuttings* (In Russian: «Ладншафтная рубка»): are cuttings targeted to forming and improving of aesthetic values of forest stands and to improve their resistance to negative anthropogenic pressure (e.g. in green belts forests and forest parks).

Table 14: Timing of Intermediate Logging in Russian Far East

Types of Intermediate Logging	Age of Forest Stands by Dominant Tree Species (in yr)			
	Pine, Spruce, Fir and Larch Stands	Korean Pine, Manchurian Fir and Hardwood Stands	Softwood stands	
			Standards	Coppices
Pre-Commercial Thinning	Before 10	Before 20	Before 10	Before 5
Late pre-Commercial Thinning	11-20	21-40	11-20	6-10
Thinning in Young and Middle-Aged Stands	21-40	41-60	21-30	11-20
Thinning in Middle-Aged Stands	After 40	After 60	After 30	After 20

Intermediate loggings shall be conducted by persons, who use forest on the base of forest management plan, or by state or local authorities. Unless where logging operations are requested from the lease holder, (i.e. for both intermediate and selective logging), the public authorities shall issue a tender for the conduction of logging operations based on procedures established in Federal Law # 94-FZ dated July 21, 2005, on Placement of

Procurement Orders for Goods, Works, and Services for Public and Municipal Needs.
A procurement order for forest protection and renewal operations shall be placed combined with selling the forest stands for wood harvesting. For these purposes, a contract shall be concluded and contain elements of a public and municipal procurement contract for conducting the forest protection and renewal operations and those of a sale-purchase contract for the forest stands. Winning companies then have the right to log certain volumes in specific sub-compartments according to management plan. In theory, this serves primarily the purpose to ensure the environmental integrity of forest stands.
In practice, this may also be used as a backdoor for conducting commercial logging operations and often this clearly follows monetary interests instead of environmental concerns. The picture below was taken in Vostochnaya NHZ (bordering the project area) where intermediate logged was conducted based on an annual felling ticket approach. The image shows a spruce where logging was attempted, but as it was found that the tree is ill, the logging was not finished, and the tree was left on-site. So in practice intermediate logging operations are quite similar in terms of volumes harvested and in terms of economic focus. The below right image shows a picture of selective commercial logging, South of the project area.

Figure 7: Intermediate logging Operations

Figure 8: Selective Commercial Logging Operations

Step 1. Identification of alternative land use scenarios to the proposed JI LULUCF project activity

Sub-step 1a. Identify credible alternative land use scenarios to the proposed JI LULUCF project activity
Since the lands within the project area are strictly reserved for forestry purposes by government, other land uses are impossible. Consequently, the following alternative land uses are identified:

- **Alternative Scenario A:** The proposed project activity of avoiding any type of commercial logging is undertaken without being implemented as JI LULUCF activity. In this case, the Primorsky Forest Department would not realize any timber-related financial income from the project area.
  This scenario would also involve the use of NTFPs and logging for domestic needs by the TCT. Federal Law No 82-FZ form 30 April 1999 'About guarantee of indigenous people rights in Russian Federation' guarantees that indigenous people, such as the TCT may use the continue their traditional nature use.
- **Alternative Scenario B:** Concession would only be granted for intermediate logging and selective sanitary logging activities based on the issuance of annual felling tickets as practiced since decades in other NHZ in the region. No selective commercial logging takes place.
- **Alternative Scenario C:** Following the new opportunities provided by changed legislation extensive timber harvesting operations either under long-term concession or annual felling tickets would take place, where
  - Forest stands that have a Korean Pine share below 30% would be managed under selective commercial logging complemented by intermediate logging and selective sanitary logging and
  - Forest stands having a Korean Pine share above 30% would be managed under intermediate logging and selective sanitary logging.

At the 25th of January 2010, a regulation came into force, which avoids the logging of any Korean Pine trees. This regulation is not bound to the forest law as such. Still, the option of logging all other tree species during any type of logging operation would not be affected by this.

Sub-step 1b. Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

Alternative Scenario A. It is the decision/assessment of the Forest Department of Primorsky Krai whether a NHZ is leased for any type of permitted timber logging or not. There are no binding laws that force the Forest Department to lease the Bikin NHZ. Hence, Alternative Scenario A is consistent with the forest laws of the Russian Federation.

Alternative Scenario B. Even before the new Forest Code of the Russian Federation came into force after 2007, silvicultural treatments such as intermediate logging and other non-commercial forms of logging such as selective sanitary logging were allowed with the objective that such silvicultural measures are required to ensure long-term stability and productivity of the forest stands. Also the new regulations allow for these types of operations in all stands of the project area with the exception that Korean Pine trees cannot be logged in any case since January 2010. Such logging operations are not regarded as activities aiming at timber harvesting for commercial purposes.

The management of NHZ is governed by three legal documents, the Forest Codex, the Rules Use of Forest with Different Protective Status and the Rules of Wood Harvesting. A legal analysis of the three documents is provided below:

- **Forest Codex** (2007)**.** According to the new forest code, distinct logging operations are related to the different forest areas.
  - Article 10 (Classification of Forests According to Their Designation), §1 of the new forest codex divides forest land into protection forests, exploitation forest and reserve forests.
  - Article 12 (Forest Development), §4 specifies that protection forests have the purpose to fulfill environmental functions (water protection etc.). Moreover it specifies that protection forests may be used for logging as long as they fulfill their environmental services.
  - Article 102 (Protection Forests and Special Protection Parcels of Forests), §2.2.4.E, §2.2.4.H and §2.2.4.I classifies Nut Harvesting Zones (NHZ) and riparian zones as High Value Forests.
  - Article 102, §2.4 states that High Value Forests are classified as protected forests.
  - Article 102, §5 states that in protected forests and High Protected Forest Areas[18] activities, which are inconsistent with their purpose (See Article 12, §4), are restricted.
  - Article 106 (Legal Regime for High Value Forests), §1 it is noted that in High Value Forests clear cutting is prohibited, except cases specified in Article 17, §4.
  - Article 17 (Selective Cutting and Clear Cutting of Forest Stands) §4 allows clear cutting in protected forests only if selective cutting can't secure positive change of forest stands with lost environmental functions to the forest stands with high environmental functions.

  It is concluded that NHZs and riparian zones qualify as High Value Forests which are a subgroup of protected areas. Theoretically, the new forest code allows for all kind of loggings (i.e. selective and clear-cut-methods) in protected areas and hence in NHZs and riparian zones.
- **Rules of Use of Forest with different protective Status** (2010), allows selective commercial logging in stands of NHZs that have a Korean Pine share below 30%. This is allowed since the publication of "Features of use of forest with different protective status (also for High Valuable

[18] I.e. small forest patches with protection status which can be situated in protected forests, exploitation forest and reserve forests

Forests)" came into force on 25th of January 2010 by Order of Ministry of Agriculture of RF № 543[19].

- **Rules of Wood Harvesting** (2007),
    - Article 12 specifies the logging operations in stands having Korean Pine share above 30%. In those stands, commercial (clear cut and selective) logging is forbidden.
    - Article 4 specifies that intermediate, sanitary and other types of logging are allowed in both protection and exploitation forests. Consequently intermediate logging can be implemented in Korean-pine stands too.

Based on above legal analysis it is concluded that it is allowed to conduct intermediate selective logging in NHZs and riparian zones as long as the forest use is consistent with other environmental functions of the forest. Consequently, Alternative Scenario B is in line with forest laws and regulations of the Russian Federation.

Alternative Scenario C. Following the new Forest Code of the Russian Federation that came into force in 2007 a series of new amendments, rules and regulations was published by the government affecting the former protected status of the Bikin NHZ, as they foresee a different way of management of NHZs. Based on the new legislation that was signed on the 6th of November 2009 and came into force on 25th of January 2010 (Russian Forest Code, Articles 102, 106, Order of Ministry of Agriculture of RF № 543), it's possible to carry out not only intermediate logging or selective sanitary logging in water protective forests, nut harvesting zones, forests near water objects, but also selective commercial logging in mature and over-mature forests. Grown-up forest stands with less than 30% Korean Pine (by volume) making up for 59% of the project area qualify for commercial timber harvesting operations. Forest stands having a Korean Pine share of more than 30% and more are only eligible for intermediate logging and selective sanitary logging, but not for selective commercial logging.
In addition to the legal documents cited above the following orders issued by the Russian Ministry of Agriculture (at that time in charge of the forestry sector of Russia) and by the Russian State Forest Agency (to which responsibility was handed over) prove the legal opportunity for selective commercial logging in Bikin in addition to intermediate logging and selective sanitary logging:

- **Order of Ministry of Agriculture of RF # 543 from 06.11.2009** ("About confirmation of features of utilization, protection, safeguard and reproduction of forests allocated in water protection zones, forests with nature protection and other objects with protection functions, valuable forests, and also forests allocated on particularly protective forest areas", valid from 25.01.2010 until 29.01.2011), and
- **Order of State Forest Agency (Rosleskhoz) # 485 from 14.12.2010** ("About confirmation of features of utilization, protection, safeguard and reproduction of forests allocated in water protection zones, forests with nature protection and other objects with protection functions, valuable forests, and also forests allocated on particularly protective forest areas", valid from 30.01.2011), both specify that
    - In state forest protective belts, anti-erosion forests, forbidden forest belts along water reservoirs, spawning-protective forests belts, forests of desert, semi-desert, forest-steppe, forest-tundra zones, steppes, mountains, belt pine forests, and also in nut harvesting zones and forest fruit stands selective commercial logging might be implemented with very low, low and temperate intensity, excluding sanitary logging, which intensity for dying, damaged and low-valuable stands can reach very high intensity, as determined by Logging Rules.
    - Intermediate logging of high and very high intensity can be also implemented in case of needs to form juvenile stands in nut harvesting zones forests and forest fruit stands.
    - In belt pine forests and nut harvesting zones any reconstructive logging types are prohibited.

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[19] Please note, the Russian name of the document reads Особенности использования, охраны, защиты, воспроизводства лесов, расположенных в водоохранных зонах, лесов, выполняющих функции защиты природных и иных объектов, ценных лесов, а также лесов, расположенных на особо защитных участках лесов № 543]

It is concluded that a mixed scenario (comprising selective commercial logging without Korean Pine and intermediate logging plus selective sanitary logging) would be legally applicable.

This conclusion is evidenced by several facts:

- First, Pozharskaya NHZ is currently leased as commercial logging concession to a logging company. This concession is located within 10km of the project area.
- Second, the Forest Department of Primorsky Krai issued a tender for the Olginskaya NHZ[20].
- It is even more confirmed by the letter of the Deputy Head of Primorsky Forestry Department, Mr S.E. Pstyga, to WWF Russia dated 25th of August 2011. This letter states that the calculations of the AAC and annual logging area as calculated by the Far Eastern branch of "Roslesinforg" (accredited forest management planning company) for the project area is accurate and based on Russian forestry legislation valid in 2008 year.
  However, the Head of the Forest Department mentions that the project should also consider commercial selective logging in mature and over-mature forests according to The Russian Forest Code, articles 102, 106, "Features of use of forest with different protective status …" established by Ministry of Agriculture on November, 6th, 2009, №543.
- In the letter from Head of Primorsky Forestry Department, Mr D.A. Rybnikov to WWF-Russia, Amur Branch, forest officials confirms that all the calculations provided for intermediate, sanitary and commercial selective logging on the project area 399.0 thousand m^3 as AAC on the area 9287.4 ha are correct (letter dated 8th of November 2011).

It is concluded that the Alternative Scenario C is in line with forest laws and regulations of the Russian Federation, as long as it is considered during logging volume and area calculation that:

- Before 25th of January 2010 only intermediate logging and sanitary logging (with Korean pine) was legally possible, and

After 25th of January 2010 until now selective commercial logging + intermediate logging + selective sanitary logging (minus Korean Pine volumes) could be carried out according to Russian forest legislation.

Outcome of Sub-Step 1. Finally it is concluded that Alternative Scenario A, Alternative Scenario B and Alternative Scenario C passes sub-step 1b. All three are further analyzed in step 2.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method
The proposed project activity generates no financial or economic benefits other than JI related income. Thus option one of the investment analysis is applicable.

Please note the TCT has the right to use Bikin NHZ for the collection of NTFPs such as Korean Pine nuts for commercial purposes (which is mentioned in the concession contract between forest department and the TCT). Still this right is not bound to the lease of the forest concession. Also in absence of the lease of the concession by TCT, the TCT would have had the right to collect NTFPs.

Sub-step 2b. – Option I. Apply simple cost analysis
Project Scenario. The JI revenues shall cover the annual concession fees which, according to the concession contract, TCT has to pay to the Forest Department on an annual basis. Moreover JI revenues from the project shall finance the protection and monitoring measures as well as infrastructure

[20] Tender documents are available under http://old.primorsky.ru/departments/controls/?s=1436

development (investment in more efficient electricity generation) and investment in better education system (Please refer to CCB documentation for more details[21]).
TCT has no other income from the project scenario than JI related revenues.

It is concluded that the project scenario is clearly only feasible if developed under Joint Implementation.

Alternative Scenario A. The Forest Department of Primorsky Krai may not lease the concession for intermediate selective logging. In this case, the forest department would not receive any stumpage fees.

- Average stumpage fees (2010) for Spruce and Fir amount to 40 Ruble/m^3 (low range) and fees for oak rise up to 500 to 1,000 Ruble/m^3 (high range).
- The total commercial volume of the Bikin NHZ amounts to 103.0 million m3.
- If the forest department would allow for intermediate logging of the Bikin NHZ, it may generate significant income.
- If the forest department does not allow for intermediate selective logging, it falls short on the income from stumpage fees.

It is concluded that Alternative Scenario A is not plausible, as the Forest Department would fall short of a significant income source.

Alternative Scenario B. Following the rational outlined in the analysis of Alternative Scenario A, it becomes clear, that allowing for intermediate logging including selective sanitary logging in the Bikin, would generate significant income for the Forest Department. This is considered as a plausible baseline scenario.

Alternative Scenario C. Following the rational outlined in the analysis of Alternative Scenario A and B it is obvious that a combination of selective commercial logging, intermediate logging and selective sanitary logging would generate highest financial revenues for the Forest Department. Therefore, it is considered as the most plausible baseline scenario.

Step 4. Common Practice Analysis defines in a first step the reference region. In a second step, similar activities are identified with respect to a) scale, b) environment, c) laws and regulations,

Definition of Reference Area. The geographical reference was identified as follows:

- Primorsky krai is bordered in the south to North Korea and in the east to China. In the North it is bordered by Khabarovsk kraj. Following CDM EB35, Annex 17, §34, China and North Korea are excluded from the reference area as they are other countries. Khabarovsk krai is excluded for the following reasons:
    - o Khavarovsk krai has a different forest structure and as such is not comparable to Primorski krai. It features a higher share of boreal forests (with low standing volumes) and low shares of temperate forests. Logging operations in Khabarovsk krai are consequently conducted mainly based on so-called ‘commercial final logging’, i.e. clear cuts. In contrary, Primorski krai, features only temperate forests. Logging operations are mainly based on selective commercial operations. Hence Khabarovsk is not comparable to Primorski krai.
    - o Khabarovsk kraj logging operations started earlier than in Primorski krai, the forest stands are tentatively overharvested and not economically attractive for timber harvesting. The remaining unlogged forest stands are under a strong protection status such as e.g. the Anuiski national Park.
    - o Unlike Khabarovsk, Primorski krai is considered as international hub for logging operations. There are no known exports of timber from Primoryski krai to Khabarovsk.

[21] Document available at www.climate-standards.org/projects/index.html

Also the logging companies directly bordering the Bikin, such as Primorsky Gok, transport their timber either directly to China or to Vladivostok. Khabarovsk is not considered to be a realistic destination for timber in the region.

- **Conclusion.** Based on the above considerations, Primorski krai was identified as the reference region. The subsequent analysis consequently focuses at evaluating common practice in Primorski krai.

Definition of Similar Activities. Following the tool to determine additionaality for CDM A/R, (CDM EB35, annex 17, §34, similar project activities shall be determined according to the following criteria:

- **Similar of Scale.** The additionaility tool defines similar project activities as project activities having a similar scale. 'Similar Size' is not further specified in this tool. Still the Guidelines for common practice' (EB63Annex 12, §5) define similar scale as +/-50%.
  The proposed project leases a total concession area of 461,154 ha in order to protect it from logging. There is no un-leased forest in the reference region, which is not subject to logging. Please refer to Section E.4, Figure 10 and Figure 11 for a detailed analysis. It is concluded that the proposed project does not classify as common practice.
- **Similar Environment.** The proposed project is located in an area which was not yet subject to logging.
  As shown by Figure 11 in Section E.4 there is no unlogged area in the reference region and the neighboring Khabarovsk kraj, which is not subject to logging (I.e. not considering Protected Areas which are protected from commercial selective- and/or final logging). It is concluded that the proposed project activity is not common practice.
- **Similar Legal Framework.** The proposed project envisages the protection from selective commercial and intermediate logging.
  That this is legally feasible is shown in the legal analysis (Section B4, step 2) and confirmed by the independent forest research institute (FEFRI, Annex 2.1) and by the Forest Department itself (Annex 2.3). There is no legal constraint to logging operations as specified by Annex 2.1 and confirmed by Annex 2.3. Consequently, similar activities are characterized as selective commercial and intermediate logging activities.
  In order to demonstrate, that it is common practice for logging companies to use their approved AAC, the logging benchmark for selective commercial logging in Primorski krai was determined (please refer to table below). This benchmark compares the AAC for selective commercial logging, for leased areas, with the actual logged volume. It was found that logging companies use their AAC in average to 92%. Please note, the AAC for the Primorsky Krai was aggregated from forestry unit management plans. The input data and data sources are presented in Annex 2.5.

Table 15: Determination of a Selective Commercial Logging Benchmark for Primorye		
Item	**Data**	**Source**
Total AAC of Primorsky Krai (in m3)	3,022,800	Forestry regulative documents for all management units of Primorsky Krai
Forest Area of Primorsky Krai (in ha)	11,478,000	Forest management plan of Primorsky Krai
Logged Volume on Concessions (in m3)	1,573,000	Forest management plan of Primorsky Krai
Forest Area leased to Logging Concessions (in ha)	6,501,915	Forest management plan of Primorsky Krai
Share of forests under concessions in Primorsky Krai (in %)	57%	Calculated
Total AAC of Logging Concessions (in m3)	1,712,318	Calculated
% of AAC used on Logging Concessions in Primorsky Krai	92%	Calculated

- **Illegal logging.** There is a great risk that the actual logging exceeds the AAC instead of being not used, especially in those areas which were not yet subject to logging.
    - **Illegal Loging in the Primorski Krai.** There greatest risk of illegal logging is associated with high-value hardwoods (i.e. oak, ash, linden and elm). WWF Russia estimates that 50-75% of these species are logged illegally. A detailed analysis for Mongolian Oak was conducted by comparing the AAC of Primorski- and Khabarovsk krais with data of the Customs Service of the Russian Federation, monitoring the timber export. This approach shows that actual logging of oak (*quercus mongolica*) exceeds the allowed logging volume by 215% (i.e. still neglecting the domestic demandWWF Russia, forthcoming, Illegal Logging in Kavarovsk and Primorye, p3).
    - **Post Felling Inventory in Neighboring NHZ.** FEFRI conducted a post felling inventory analysis for the Vostochnaya NHZ which is located south of the project area (directly bordering). The analysis shows that the logging amounts to 299.57% of the volumes allowed by the Forest Department. This analysis may be provided to the AIE upon request.

Based on steps 1, 2, and 4 it is concluded that the proposed JI activity is additional.

Baseline Scenario. Following above analysis, logging operations classified as ‘Selective Commercial Logging’ as well as ‘Intermediate Logging including Selective Sanitary Logging’ would occur in absence of the project activity. The related baseline emissions are calculated following strictly the formulae of the selected Logged to Protected Forest methodology.

Calculation of Primary Parameters. The annual baseline emissions in tCO_2 are calculated based on the quantification of the annual CO2e emissions arising of forest degradation and the annual CO_2e emissions of logging operations (i.e. hauling, skipping, transportation, etc.):

$$C'_{baseline,t} = C'_{degradation,t} + C'_{emissions,t} \quad (3\text{-}1)$$

Parameter	Description	Unit
$C'_{baseline,t}$	Annual total carbon emissions associated with the baseline scenario in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C'_{degradation,t}$	Annual total carbon emissions associated with degradation as a result of the baseline activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C'_{emissions,t}$	Annual total carbon emissions associated with the baseline activity of selective logging operations in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

The emissions of forest degradation are determined based on the quantification of emissions due to the decay of deadwood, the emissions from long-term harvested wood products (ltHWP), growth foregone as well as re-growth after logging operations. Please note, that growth foregone was not considered under the project activity. Comparing old and new inventory data was considered as an option to quantify the tC increase due to growth foregone, but it was found that this could also relate to lesser quality levels of the old inventory. No appropriate data basis could be identified for a reliable quantification of growth foregone. Hence, the proposed project opts to conservatrively neglect growth foregone.
The detailed approach is presented in below formula 3.2:

$$C'_{degradation,t} = \left[(C_{DW_{decay},t} + C_{ltHWP_{oxidation},t} + C_{stHWP_{oxidation},t} + C_{regrowth,t}) \; x \; \frac{44}{12}\right] \quad (3.2)$$

Parameter	Description	Unit
$C'_{degradation,t}$	Annual total carbon emissions associated with degradation as a result of the baseline activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C_{DW_{decay},t}$	Annual carbon leaving the deadwood pool due to the decay of deadwood in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{oxidation},t}$	Annual carbon due to the combined delayed oxidation of long-term harvested wood products and immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{stHWP_{oxidation},t}$	Annual carbon due to the combined delayed oxidation of short-term harvested wood products and immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{growth_{foregone},t}$	Annual carbon lost due to growth foregone in the aboveground biomass in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{regrowth,t}$	Annual carbon increase in the biomass due to regrowth following logging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\frac{44}{12}$	The ratio of molecular weight of carbon dioxide to carbon, see Appendix C	tCO_2-e tC^{-1}

Measured Data Pathway. The average carbon in merchantable logs per ha, per sub- compartment is determined based on detailed forest inventory information. The project participants ordered the development of a forest inventory from the State Forest Inventory Department, 'Dallesproject'.

Dallesproject is an independent state agency which provides forest information services, based in Khabarovsk. In 2009/2010 Dallesproject developed a detailed inventory for the project area (Inventory type II).
The inventory was developed by field measurements combined with Quickbird satellite imagery (i.e. with a resolution of 1m). It specifies the commercial volume, height, DBH per tree species, for each sub-compartment. This is complemented by information on density and age class. This information was compiled for 14,765 stands (or so-called sub-compartments) of the concession parts, including the 13,514 sub-compartments of the project area. Subsequently, only the data of the project area was used to calculate the primary parameters of the proposed project. Following the methodology, Section 3.2.2, this approach is termed ‘measured data pathway’. Hence, the proposed project follows the approach ‘where the detailed Forest Inventory Report (FIR) is available, as described in Section 3.2.1.3.1. The methodology offers two approaches:

A) Where inventory data does not distinguish between different forest product types
B) Where inventory data distinguish between different forest product types

As the FIR does not distinguish between forest product types, Option A was applied.

Stratification of the Project Area. The project area features a total area of 450,374 ha. This total area was stratified in three forest types: Confer Forest, Hardwood Forest and Softwood Forest. As can be seen from table at the left, Conifer Forest covers the majority of the project area (i.e. 85%) whereas Softwood Forest and cover minor shares (i.e. 10% and 4% respectively).

Table: Summary of the Stratification of the Project Area

Stratum	Area (in ha)	Area (in %)	Merchantable Volume (in m3)	Volume (in %)
Conifer	383,402	85%	87,663,990	0.861
Hardwood	47,138	10%	10,828,940	0.106
Softwood	19,835	4%	3,339,910	0.033

Establishment of PSPs. Please note, Section 3.2.2 requires the establishment of permanent sampling plots (PSPs). But the inventory of the proposed project was developed by measurements along transects. This approach was applied by the State Forest Inventory Department in accordance with the ‘Adoption of the Forest Inventory Instruction’’ as stipulated by the Ministry of Natural Resources and Environment of the Russian Federation[22].
Even though stipulated by Russian Forest Regulation, this approach is not in line with the details of the methodology. This does not affect the quality of the proposed baseline, as a) the inventory features a high quality level (i.e. Class II) and b) the AAC, as confirmed by the Forest Department, is independent from the newly conducted inventory.

Step 1 – Select Equation for Determination of the Growing Stock per Hectare.

Dallesproject determined the volume, per sub-compartment, per tree species following the official approach as stipulated in the ‘Adoption of the Forest Inventory Instruction’’ by the Ministry of Natural Resources and Environment of the Russian Federation, §107 and related formulae. Please note, this data already specifies the commercial volume, not the growing stock.

Step 2 – Apply the Equation to Calculate the Growing Stock in a Sub-Compartment

[22] ‘Adoption of the Forest Inventory Instruction’, 2008, Ministry of Natural Resources and Environment of the Russian Federation, Order No 31, 6th February 2008.

The equation was applied by Dallesproject to determine the total volume per sub-compartment. Additionally the inventory specifies the volume, DBH, height and age class per tree species, per sub-compartment. This data was provided by Dallesproject to the project participants for all 13,514 sub-compartments of the project area. This is considered as an excellent data base for the determination of forest carbon stocks. Please note, this data already specifies the commercial/merchantable volume, not the growing stock. The table above presents a summary of mechantable volume. The full data set is provided in the proposed project's excel file.

Step 3 – Apply Steps 2 to 6, Section 3.2.1.2.1, A to Calculate the Carbon in Merchantable Logs

- Step 2 is not needed, as the primary data already specifies the commercial volume (V_{merch}).
- Step 3 – Tier 2, tree species specific density coefficients were identified based on the FAO Forest Resource Assessment (FRA) for the Russian Federation. For those tree species which were not specified in the FRA (i.e. species having a minor share of the total growing stock), tree species specific IPCC default values were applied. The applied coefficients and their data sources are presented in the table below.
- Step 4 - The FAO uses a country specific default value of 0.5. Instead of this rather general Tier 2 value, we applied IPCC tree species specific data, which result in a weighted average CF of 0.4987. This value was applied which is considered to be conservative. The chosen coefficients as well as their data sources are presented in the table below.
- Step 5 – Apply formula 3-3.
  For each compartment, the commercial volumes of major tree species were provided. These were combined with tree-specific density and carbon fraction (CF)-coefficients. The quantification follows formula 3.3 presented below.

$$\overline{C}_{merch,j,t=0} = D \; x \; CF_{wood} \; x \; \overline{V}_{merch,j,t=0} \qquad (3\text{-}3)$$

Parameter	Description	Unit
$\overline{C}_{merch,j,t=0}$	Average carbon per hectare in merchantable logs in stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
D	Wood density for the forest with corresponding climate region and ecological zone (see Appendix B)	(t d.m.) m^{-3}
CF_{wood}	Carbon fraction of wood for the forest	tC $(t\ d.m.)^{-1}$
$\overline{V}_{merch,j,t=0}$	Average merchantable logs‟ volume per hectare in stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	m3 ha^{-1}

Table 16: Tree Species, Density Factors and Carbon Fraction

Latin Name	Betula	Betula alleghaniensis	Betula ermanii	Ulmus	Quercus	Picea	Salix	Tilia	Pinus koraiensis	Acer	Larix	Tilia	Alnus	Juglans	Populus tremor	Abies	Populus tremor	Prunus padus	Chosenia	Fraxinus
Russian - English Name	Береза белая - Comon birch	Береза желтая - Yellow birch	Береза каменная - Stony birch	Липа - Elm	Дуб - Oak	Ель - Spruce	Ива - Willow	Липа - Lime	Кедр (сосна кедровая) - Korean pine	Клен - Maple	Лиственница - Larch	Липа - Lime	Ольха - Alder	Орех грецкий - Manchurian walnut	Осина - Aspen	Пихта - Fir	Тополь - Poplar	Черемуха - Bird Cherry	Чозения - Chosenia (lat.)	Ясень обыкновенный - Ash
Density [23]	0.51	0.51	0.51	0.49	0.58	0.40	0.45	0.49	0.42	0.52	0.52	0.35	0.45	0.53	0.40	0.40	0.35	0.49	0.45	0.49
Carbon Fraction	0.48	0.48	0.48	0.48	0.48	0.51	0.48	0.48	0.51	0.48	0.51	0.48	0.48	0.48	0.48	0.51	0.48	0.48	0.48	0.48

Density Source: FAO 2005, FRA Russian Federation, Section 6.3. If no tree species specific data was available, IPCC (2006) defaults were used.
Carbon Fraction Source IPCC 2006 Table 4.3: This is conservative, compared to FAO, FAO 2005, FRA Russian Federation using a default of 0.5.

- Step 5 continued: The following approach was applied:
  - Table 4 outlines the merchantable volume for year t=1 and all subsequent years. The first figure amounts to 40.41 m^3/ha, the second to 42.96 m^3/ha.
  - A weighted average density of 0.4476 t.d.m/m3 was applied.
  - Following the same approach, the weighted average carbon fraction of the project areas was determined to be 0.4987 tC/t.d.m. Considering above density and carbon fraction results in an average carbon stock of 9.02 tC/ha, for the first year. For all subsequent years a value of 9.59 tC/ha was applied.
- Step 6 - Formula 3-4 proposes an approach to determine the average carbon per ha in merchantable logs.
  Please note, as the baseline logging is not specified for different sub-compartments of the project area, this was calculated based on the average carbon stock of all 13,514 sub-compartments (i.e. the merchantable volume per stratum equals the average merchantable volume. Please note, as a cross-check formula 3.34 results in the identical outcome as above, 9.02/9.59 tC/ha.

$$\overline{C}_{merch,t=0} = \frac{\sum_{j=1}^{J} \overline{C}_{merch,j,t=0} x A_{project,j,t=0}}{A_{project,t=0}} \quad (3\text{-}4)$$

Parameter	Description	Unit
$\overline{C}_{merch,t=0}$	Average carbon per hectare in merchantable logs in the Project Area determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}

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[23] Please note, values at 0% Humidity.

$\bar{C}_{merch,j,t=0}$	Average carbon per hectare in merchantable logs in stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$A_{project,j,t=0}$	Project Area within each stratum j, (where j=1,2,3 ... J strata) where the IFM-LtPF project activity will be implemented; determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	ha
$A_{project,t=0}$	Project Area where the IFM-LtPF project activity will be implemented; determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	ha

Based on a) the average carbon per ha in stocks which would be removed under the baseline scenario, and based on b) the total annual net harvesting area, presented in Table 4, the total carbon in merchantable logs is calculated following formula 3-15a below:

$$C_{merch,t=0} = \bar{C}_{merch,t=0} \; x \; A_{NHA_{annual},t} \qquad (3\text{-}15a)$$

Parameter	Description	Unit
$C_{merch,t=0}$	Annual total carbon in the merchantable logs harvested in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{C}_{merch,t=0}$	Average carbon per hectare in the merchantable logs determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

Following the above approach results in a $C_{merch,,t=0}$ of 29,975 for year 1 and a value of 88,033 tC annually for all subsequent years of the crediting period.

Annual total carbon AGB of the growing stock harvested per year is determined following formula 3-16a below:

$$C_{AGB_{gstock},t} = \bar{C}_{AGB_{gtstock},t=0} \; x \; A_{NHA_{annual},t} \qquad (3\text{-}16a)$$

Parameter	Description	Unit
$C_{AGB_{gstock},t}$	Annual total carbon in the aboveground biomass of the growing stock harvested every year in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{C}_{AGB_{gtstock},t=0}$	Average carbon per hectare in the aboveground biomass of the growing stock determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

In a first step, the AGB is determined for 13,514 compartments based on Biomass Expansion Factors (BEF) used in FAO's report on Forest Resources of the Russian Federation. Based on these BEFs, the weighted average BEF was determined, amounting to 1.40.

Table 17: Biomass Expansion Factors

Species (English)	Biomass Expansion Factors	AGB per Species (in t.d.m)	Share of Species in total AGB (in %)	Calculation of the Weighted Average BEF
Larch	1.48	2,495,275	0.04	0.06
Maple	1.38	949,404	0.02	0.02
Ash	1.38	2,829,669	0.05	0.06
Spruce	1.43	14,908,560	0.24	0.34
Korean Pine	1.46	14,756,058	0.24	0.35
Elm	1.38	2,347,882	0.04	0.05
Birch	1.30	2,676,460	0.04	0.06
Yellow Birch	1.30	9,554,495	0.15	0.20
Fir	1.35	5,746,729	0.09	0.12
Manchurian walnut	1.38	8,970	0.00	0.00
Alder	1.38	122,663	0.00	0.00
Aspen	1.32	419,019	0.01	0.01
Lime	1.35	3,161,833	0.05	0.07
Oak	1.40	1,553,809	0.02	0.03
Poplar	1.38	193,891	0.00	0.00
Sources: FAO 2005, FRA Russian Federation, Section 6.3			Average BEF	1.40

Combining the BEFs with the commercial volumes, given by the forest inventory data results in AGB volume of 62,298,713 t.d.m. in the project area. The average AGB volume per ha amounts to 138.33 t.d.m./ha. Based on the weighted average carbon fraction, discussed above, this results in $C_{AGB\_gstock,t=0}$ of 68.98 tC/ha.

In a next step, this is combined with the $A_{NHA,\ annual}$ presented in Table 4. This finally results in the calculation of the total AGB carbon stocks of the areas harvested per year, $C_{AGB,gstock,1}$ = 229,209tC and $C_{AGB,gstock,\ n>1}$ = 604,417 tC.

Net Carbon from the Deadwood Pool. Following the guidance of the chosen methodology, the baseline includes the calculation of emissions of the deadwood pool and its decay. The volume of tC leaving the deadwood pool per year is calculated following formula 3-17.

$$C_{DW_{decay},t} = f\left(C_{DW_{in},t}, k_{decay}\right) \qquad (3\text{-}17)$$

Parameter	Description	Unit
$C_{DW_{decay},t}$	Annual carbon leaving the deadwood pool due to the decay of deadwood in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

k_{decay}	Rate of decay of the deadwood pool	yr

Formula 3-17 shows that the deadwood decay has to be considered as a function of the dead wood decay parameter and the input of deadwood into the deadwood (DW) pool. The table below outlines the approach for the determination of k.

Table 18: Determination of the Weighted Average Decay Rate			
Korean Pine Share (of total volume, in t.d.m)	k Pinus Koreansis	k Rest	Weighted Average k
0.284	0.015	0.075	0.06
Source: Calculated based on: Mikhail Yatskov, Mark E. Harmon and Olga N. Krankina, 2003, A Chronosequence of Wood Decomposition in the Boreal Forests of Russia, Canadian Journal of Forest Resources, Vol. 33. The k value for pinus koreansis was taken from Table 8, for Khabarovsk. The k value for all other species was deducted from the graph on page 1223, at a mean annual temperature of the project area of 4.8°C.			

In a next step, the input into the DW pool is specified following formula 3-18 below:

$$C_{DW_{in},t} = C_{RSD_t} + C_{branch_{trim},t} \qquad (3\text{-}18)$$

Parameter	Description	Unit
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
C_{RSD_t}	Annual carbon in the residual stand damage in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{branch_{trim},t}$	Annual carbon in branches and trimmings left over from harvesting in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

The annual carbon in the residual stand damage and the annual carbon from trimmings are determined in below functions.

The annual carbon in the residual stand damage is specified in formula 3-19.

$$C_{RSD,t} = f_{RSD} \ x \ C_{merch,t} \qquad (3\text{-}19)$$

Parameter	Description	Unit
$C_{RSD,t}$	Annual carbon in the residual stand damage in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
f_{RSD}	Factor for residual stand damage, based on the fraction of quantity of carbon damaged in the residual stand to the quantity of carbon in total merchantable logs harvested	dimensionless
$C_{merch,t}$	Annual total carbon in merchantable logs harvested in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (See Equations 3-15a and 3-15b)	tC

The factor of the residual stand damage was determined based on a recently published article by Kovalev (2011), *The Need for a Transition to Sustainable Forest Management in Russia Far East*. Kovalev quantifies various sub-types for damage to trees in the process of logging. This was quantified for selective commercial logging, for intermediate logging and for other types of logging operations in Russia Far East. The following approach was applied:

- The table below quantifies the damage in m3 of commercial volume (i.e. without branches and crown cover). Kovalev indicates a higher and lower range of damage.
- The sub-total of selective commercial logging was calculated ranging from 11 to 41 m3.
- The sub-total of intermediate logging was calculated ranging from 19 to 50 m3.
- The lower value of both logging operations was taken and weighted with the share of intermediate and commercial logging. This results in a lower damage value of 12.62 m3 damage per hectare.
- This was converted from commercial volume to total volume (i.e. including branches and crowns) by using the average BEF resulting in a lower damage value of 17.60 m3 per hectare.
- Finally the lower damgage value was converted to fRSD by dividing it by the logging volume per hectare. This results in a fRSD of 41%.

Using in all steps the lowest values is considered as being conservative. The result is significantly lower than the default values of the VCS methodology (ranging from 174% (Brown et al., 2005) to 310% (Pearson et al. 2005)).

Table 19: Calculation of fRSD

	Selective Commercial Logging (in m3/ha Commercial Volume)		Intermediate Logging (Sanitary) (in m3/ha Commercial Volume)	
	Lower Value	Upper Value	Lower Value	Upper Value
Logged but Left on Site	1	6	3	9
Uprooted and Left on Site	3	11	7	15
Destroyed by Logging Machinery	3	11	6	16
Logged and Left on Storage Place	4	13	3	10
Sub-Totals	**11**	**41**	**19**	**50**

Source: Kovalev, A. "The Need for a Transition to Sustainable Forest Management in Russia Far East", published in Vestnik TOGU (journal) No2.21, 2011, pages 61-70

Lowest Value Selective Commercial Logging	11
% Selective Commercial Logging	60.13%
Lowest Value Intermediate Logging	19
% Intermediate Logging	31.60%
Weighted Average of 'Lowest Values'	12.62
Average BEF	1.40
Lowest Value including branches and crowns	17.60
Logging Volume	42.96
fRSD	**0.41**

The figure below shows two WWF experts discussing the deadwood volumes which were left after intermediate logging operations at a storage place. The image was taken in the Vostochnaya NHZ directly bordering the project area.

Figure 9: Deadwood Left at Storage Place

Function 3-20 below outlines the approach for determining the annual carbon input into the DW pool based on trimmings and left over from branches.

$$C_{branch_{trim},t} = f_{branch_{trim}} \, x \, C_{merch,t} \qquad (3\text{-}20)$$

Parameter	Description	Unit
$C_{branch_{trim},t}$	Annual carbon in branches and trimmings left over from harvesting in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$f_{branch_{trim}}$	Annual total carbon in the merchantable logs harvested in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{merch,t}$	The fraction of branches and trimmings in the aboveground biomass remaining after trimming of the merchantable logs transferred to the DW pool	dimensionless

The following approach was applied:

- The k value as determined under formula 3-19 was used.
- In the absence of specific trimming activities, BEF value was applied. The calculated, weighted average BEF (determined in Table 17) was used.

Formula 3-21 was followed to determine the decay of deadwood volume in the DW pool over time:

$$F_{DW_{remain},t} = e^{-k_{decay} \times t} \quad (3\text{-}21)$$

Parameter	Description	Unit
$F_{DW_{remain},t}$	Annual fraction of carbon in the deadwood pool that would remain in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) after applying the rate of decay	Dimension-less
k_{decay}	Rate of decay of the deadwood pool	yr^{-1}
t	1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity	yr

Formula 3-22a was used to calculate the volume of the deadwood pool per year:

$$C_{DW_{pool},t} = \sum_{t=1}^{t*} F_{DW\_remain\_t} \; x \; C_{DW_{in},t} \quad (22a)$$

Parameter	Description	Unit
$C_{DW_{pool},t}$	Cumulative carbon remaining in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$F_{DW_{remain_t}}$	Annual fraction of carbon in the deadwood pool that would remain in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) after applying the rate of decay	dimensionles s
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Formula 3-23 allows to calculate the accumulated carbon output of the DW pool:

$$C_{DW_{out},t} = \sum_{t=1}^{t*} C_{DW_{in},t} - C_{DW_{pool},t} \quad (3\text{-}23)$$

Parameter	Description	Unit
$C_{DW_{out},t}$	Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{pool},t}$	Cumulative carbon remaining in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Formula 3-24 finally allows to calculate the annual output (i.e. not accumulated) of the DW pool which are considered as baseline emissions:

$$C_{DW_{decay},t} = C_{DW_{out},t} - C_{DW_{out}t-1} \quad (3\text{-}24)$$

Parameter	Description	Unit
$C_{DW_{decay},t}$	Annual carbon leaving the deadwood pool due to the decay of deadwood in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{out},t}$	Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{out}t-1}$	Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year t-1, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Table 20: Calculation of the Deadwood Pool

t	$F_{DW_{remain},t}$	Deadwood Pool in tC										$C_{DW_{pool},t}$
1	0.94	22,764										22,764
2	0.89	21,482	63,818									85,300
3	0.84	20,272	60,225	63,818								144,315
4	0.79	19,130	56,833	60,225	63,818							200,007
5	0.75	18,053	53,633	56,833	60,225	63,818						252,562
6	0.71	17,037	50,613	53,633	56,833	60,225	63,818					302,159
7	0.67	16,077	47,763	50,613	53,633	56,833	60,225	63,818				348,962
8	0.63	15,172	45,073	47,763	50,613	53,633	56,833	60,225	63,818			393,129
9	0.59	14,317	42,535	45,073	47,763	50,613	53,633	56,833	60,225	63,818		434,810
10	0.56	13,511	40,140	42,535	45,073	47,763	50,613	53,633	56,833	60,225	63,818	474,143

Table 20 above presents the calculation of the deadwood pool. It can be seen that the volume stored in the DW pool increases from 22,764 tC in year 1 to 0.47 mio tC in year 10. Based on above calculation and based on above formulae, the annual volume of decomposed deadwood is calculated in below table.

Table 21: Calculation of the Decay of Deadwood

t	$F_{DW_{remain},t}$	$C_{DW_{pool},t}$	$\sum_{t=1}^{t*} C_{DW_{in},t}$	$C_{DW_{out},t}$	$C_{DW_{decay},t}$
1	0.94	22,764	24,122	1,358	1,358
2	0.89	85,300	91,749	6,448	5,090
3	0.84	144,315	159,375	15,060	8,612
4	0.79	200,007	227,002	26,995	11,935
5	0.75	252,562	294,629	42,066	15,071
6	0.71	302,159	362,255	60,097	18,031
7	0.67	348,962	429,882	80,920	20,823
8	0.63	393,129	497,509	104,379	23,459
9	0.59	434,810	565,135	130,325	25,946
10	0.56	474,143	632,762	158,619	28,293

The above table shows the annual emissions from deadwood decomposition accounted for under the baseline. The annual baseline emissions from the deadwood decay increase from 1,358 tC in year one to 28,293 tC in year 10.

Net Carbon from the Harvested Wood Product Pool. In order to quantify the baseline emissions, it is assumed that part of the logged volume (and its carbon content) is stored in the harvested wood product (HWP) pool.
Following the applied methodology, two pools are foreseen:

- Long term Harvested Wood Product Pool (ltHWP), and
- Short term Harvested Wood Product Pool (stHWP).

IPCC 2006 (chapter 12) defines ltHWP as those products which feature a half-life over 30 years whereas stHWP are defined as having a half-life of no more than two years.

The determination of the baseline AAC differentiates in logging volumes for fuelwood and for timber. The total amount commercially utilizable timber (i.e. so-called 'liquid' or 'ликвидная древесина' in Russian language) is subdivided in fuelwood and merchantable timber (i.e. socalled 'деловая древесина' in Russian language).

Table 22: Baseline Logging by Fuelwood and Merchantable Timber

Validity		Days	Fuelwood	Merchantable Timber	Volume
From	To		in m3/ha	in m3/ha	in m3/yr
03.06.2009	25.01.2010	236	97,340	44,980	142,320
26.01.2010	31.12.2010	339	159,100	239,900	399,000
Source: Annex 2.1, Table 4, p11 and Calculation from Dallesproject for intermediate logging operations, page 2, Table1					

Please note, the intermediate logging (should) focus primarily on ensuring the environmental integrity of the forest stand. It is envisaged to log ill trees etc. Such logging operations feature a higher share of low quality wood. Year one logging operations is solely based on intermediate logging. Hence it features a higher share of fuelwood than the logging operations of year 2 and following.

The basic approach for the determination of the missions due to the oxidation of ltHWP is laid out in formula 3-25 below:

$$C_{ltHWP_{oxidation},t} = C_{ltHWP_{residues},t} + C_{ltHWP_{net-out},t} \quad (3\text{-}25)$$

Parameter	Description	Unit
$C_{ltHWP_{oxidation},t}$	Annual carbon due to the combined delayed oxidation of long-term harvested wood products and immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{residues},t}$	Annual carbon due to the immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{net-out},t}$	Annual net carbon due to the delayed oxidation of the long-term harvested wood products, leaving the long-term harvested wood products pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Step 1: Select a Lumber Recovery Factor. The below table presents the lumber recovery factor of the Primorsky Krai for the years 2007 - 2009. Following the new regulation on higher taxation of roundwood exports, the last three years have lived to see significant investments in saw mills in the krai. This is

reflected by substantial increases of the lumber recovery factor (which are also substantial higher than the default values provided by the methodology).
In order to determine the lumber recovery factor applicable to the baseline, the highest (and most conservative) factor was applied. The data was provided by the federal statistical service of Primorski krai.

Table 23: Calculation of the Lumber Recovery Factor of Primorsky Krai			
Year	Volume of Wood for Processing (in 1000m3)	Volume of Processed Wood (in 1000m3)	Lumber Recovery Factor (in %)
2007	850	341.9	0.40
2008	720	312.7	0.43
2009	755	340.2	0.45
Source: Calculation based on data provided by Primorskstat[24], 2010, Forest industry complex of Primorie.			

Step 2: Determination of ltGWP Residues. The residues which occur in the course of the processing of ltHWP are calculated based on formula 3-26 below:

$$C_{ltHWP_{residues},t} = \overline{C}_{merch,p,t} \ x \ (1 - f_{lumber_{recovery}}) x \ A_{NHA_{annual},t} \quad (3\text{-}26)$$

Parameter	Description	Unit
$C_{ltHWP_{residues},t}$	Annual carbon due to the immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\overline{C}_{merch,p,t}$	Average carbon per hectare in merchantable logs of forest product type p=sawlog, in the Project Area determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$f_{lumber_{recovery}}$	Lumber recovery factor for proportion of merchantable log converted to harvested wood product	dimensionles s
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

The input into the ltHWP pool is determined as stipulated by formula 3-27.

$$C_{ltHWP_{in},t} = \overline{C}_{merch,p,t} \ x \ f_{lumber_{recovery}} \ x \ A_{NHA_{annual},t} \quad (3\text{-}27)$$

Parameter	Description	Unit
$C_{ltHWP_{in},t}$	Annual carbon input to the long-term harvested wood products pool from sawlog in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\overline{C}_{merch,p,t}$	Average carbon per hectare in merchantable logs of forest product type p, in the Project Area determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC
$f_{lumber_{recovery}}$	Lumber recovery factor for proportion of merchantable log converted to harvested wood product	dimensionles s

[24] Primorskstat is the federal statistic service in Primorskiy krai.

$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

Step 3: Identification of rate of carbon oxidation specific to ltHWPs. Following IPCC, 2006, an annual oxidation rate of 2.3% was applied for ltHWP.

Step 4: Determine the Annual Fraction of ltHWP that Would Remain in the ltHWP Pool. The fraction of carbon which remains in the ltHWP is determined following formula 3-28.

$$F_{ltHWP_{remain}} = e^{-k_{ltHWP_{ox}} x\ t} \qquad (3\text{-}28)$$

Parameter	Description	Unit
$k_{ltHWP_{ox}}$	Rate of oxidation for long-term harvested wood products	yr^{-1}
T	1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity	yr

The volume of the ltHWP is calculated following 3-29a:

$$C_{ltHWP_{pool},t} = \sum_{t}^{t*}\left(F_{ltHWP_{remain},t}\ x\ C_{ltHWP_{in},t}\right) \qquad (3\text{-}29)$$

Parameter	Description	Unit
$C_{ltHWP_{pool},t}$	Cumulative carbon remaining in the ltHWP pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$F_{ltHWP_{remain},t}$	Annual fraction of ltHWP that would remain in the ltHWP pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) after applying the rate of oxidation	dimensionless
$C_{ltHWP_{in},t}$	Annual carbon input to the long-term harvested wood products pool from sawlog in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Formula 3-30 outlines the approach for quantifying the accumulated amount of carbon which leaves the HWP pool:

$$C_{ltHWP_{out},t} = \sum_{t=1}^{t*} C_{ltHWP_{in},t} - C_{ltHWP_{pool},t} \qquad (3\text{-}30)$$

Parameter	Description	Unit
$C_{ltHWP_{out},t}$	Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere from year t=1 to year t, (where t=1,2,3 ... t* years	tC

	elapsed since the start of the IFM-LtPF project activity)	
$C_{ltHWP_{in},t}$	Annual carbon input to the long-term harvested wood products pool from sawlog in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{pool},t}$	Cumulative carbon remaining in the ltHWP pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Finally, formula 3-31 allows for determining the volume of carbon which leaves the HWP per annum:

$$C_{ltHWP_{net_{out}},t} = C_{ltHWP_{out},t} - C_{ltHWP_{out},t-1} \quad (3\text{-}31)$$

Parameter	Description	Unit
$C_{ltHWP_{net_{out}},t}$	Annual net carbon due to the delayed oxidation of the long-term harvested wood products, leaving the long-term harvested wood products pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{out},t}$	Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{out},t-1}$	Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere in year t-1, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Based on the formulae 3-25 to 3-31, the ltHWP pool was calculated for each year as follows:

Table 24: Calculation of the Long Term Harvested Wood Product Pool

t	$F_{ltHWP_{remain},t}$	Wood Product Pool in tC										$C_{ltHWP_{pool},t}$
1	0.98	4,172										4,172
2	0.96	4,077	22,249									26,325
3	0.93	3,984	21,743	22,249								47,975
4	0.91	3,893	21,248	21,743	22,249							69,133
5	0.89	3,805	20,765	21,248	21,743	22,249						89,810
6	0.87	3,718	20,293	20,765	21,248	21,743	22,249					110,017
7	0.85	3,634	19,832	20,293	20,765	21,248	21,743	22,249				129,764
8	0.83	3,551	19,381	19,832	20,293	20,765	21,248	21,743	22,249			149,062
9	0.81	3,470	18,940	19,381	19,832	20,293	20,765	21,248	21,743	22,249		167,921
10	0.79	3,392	18,509	18,940	19,381	19,832	20,293	20,765	21,248	21,743	22,249	186,352

Based on above findings, the below table shows the calculation of the tC which leave the ltHWP pool per annum, the volume of residues which and finally the total of emissions resulting arising from the HWP pool.

Table 25: Calculation of the Emissions due to Oxidation of ltHWP							
t	$F_{ltHWP_{remain},t}$	$C_{ltHWP_{pool},t}$	$\sum_{t=1}^{t*} C_{ltHWP_{in},t}$	$C_{ltHWP_{out},t}$	$C_{ltHWP_{net\_out},t}$	$C_{ltHWP_{residues},t}$	$C_{ltHWP_{oxidation},t}$
1	0.98	4,172	4,269	97	97	5,205	5,302
2	0.96	26,325	27,035	710	612	27,759	28,371
3	0.93	47,975	49,801	1,826	1,116	27,759	28,875
4	0.91	69,133	72,568	3,434	1,608	27,759	29,367
5	0.89	89,810	95,334	5,524	2,090	27,759	29,848
6	0.87	110,017	118,100	8,084	2,560	27,759	30,318
7	0.85	129,764	140,867	11,103	3,019	27,759	30,778
8	0.83	149,062	163,633	14,571	3,468	27,759	31,227
9	0.81	167,921	186,399	18,478	3,907	27,759	31,666
10	0.79	186,352	209,166	22,814	4,336	27,759	32,094

As can be seen from the table above, the annual tC emissions amount from 5,302 tC/ha in year 1 to 32,094 tC/ha in year 10.

The basic approach for the determination of the stHWP is laid out in the formula below. It specifies the annual overall emissions from the stHWP in tC:

$$C_{stHWP_{oxidation}t} = C_{stHWP_{comm\_FW},t} + C_{stHWP_{net\_out},t} \qquad (3\text{-}32)$$

Parameter	Description	Unit
$C_{stHWP_{oxidation}}$	Annual carbon due to immediate oxidation of short-term harvested wood products (commercially harvested fuelwood) and delayed oxidation of short-term harvested wood products (paper products) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{stHWP_{comm\_FW}}$	Annual carbon due to immediate oxidation of short-term harvested wood products (commercially harvested fuelwood) leaving the project boundary in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{stHWP_{net\_out},t}$	Annual net carbon due to the delayed oxidation of short-term harvested wood products (paper products), leaving the short-term harvested wood products pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

As stipulated in the calculation of the AAC by FFRI and as it was confirmed by the Forest Department of Primorski krai, the baseline logging would harvest stHWP for fuel wood. Following the VCS methodology, the annual carbon from fuelwood is regarded as immediate emission in the year of harvest (VCS, Section 3.3.3.1, page 39). The carbon stored in stHWP is thus accounted for as immediate emission.

The annual carbon in stHWP is specified in formula 3-33:

$$C_{stHWP_{Comm\_FW},t} = \bar{C}_{merch,FW,t=0} \; x \; A_{NHA\ annual,t} \qquad (3\text{-}33)$$

Parameter	Description	Unit
$C_{stHWP_{Comm\_FW},t}$	Annual carbon due to immediate oxidation of short-term harvested wood products (commercially harvested fuelwood) leaving the project boundary in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

$\bar{C}_{merch,FW,t=0}$	Average carbon per hectare in merchantable logs of forest product type FW=fuelwood, in the Project Area determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha-1
$A_{NHA\ annual,t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

The annual carbon due to immediate oxidation of stHWP was determined as follows:

- Table 22 specifies the volume of fuelwood logged for year 1 (97,340 m3/yr, 68.4% of total logging volume) and for all subsequent years (159,100 m3/yr, 39.87% of total logging volume).
- The annual total carbon in the merchantable logs harvested was determined in formula 3-15a above. This value was multiplied by the ratio of logging for firewood to total logging volume (i.e. 68.4% for year 1, 39.87% for all subsequent years).

Carbon in Re-growth after Selective Logging. After having determined the emissions from the oxidation of HWP and the decay of DW, this section calculates the carbon which would be stored due to the regrowth of logged areas.

The model was specifically developed to quantify the increase of commercial volume (i.e. without branches and crowns) after logging. This work was published by A.A. Dorofeeva "Fragments of reforestation dynamics in Korean pine stands after industrial logging", Collection work of the Far East Forestry Research Institute, edition 12, Khabarovsk, 1974. The data was collected during field works in the south of Khabarovsk krai, quite near to Bikin in the scale of the Far East.

The carbon stock increase after logging is calculated following formula 3-38:

$$C_{regrowth,t} = (\bar{G}_{regrowth,t}\ x\ CF_{AGB})\ x \sum_{t=1}^{t*} A_{NHA_{annual},t} \qquad (3\text{-}38)$$

Parameter	Description	Unit
$C_{regrowth,t}$	Annual carbon increase in the biomass due to regrowth following logging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{G}_{regrowth,t}$	Average regrowth per hectare per year of the aboveground biomass after logging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	(t d.m.) ha-1 yr-1
CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest	tC (t d.m.)-1
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)^^	ha

The model itself is presented in below table. It is based on the following rationale:

- The model assesses the re-growth of deciduous- and conifer forests after logging in three time periods (0-5yrs, 6-10yrs and 11-15yrs).
- The annual re-growth per forest type was multiplied with the results of the stratification (85.6% conifers and 14.4% other). This allows calculating the average weighted re-growth after logging, adapted to the tree composition of the Bikin NHZ.
- As the model allows for the calculation of the commercial volume, the output was amended by multiplying it with the weighted average BEF.
- In a next step this was converted to t.d.m. by multiplying the AGB volume with the weighted average density factor.
- Finally the total re-growth (in t.d.m., including branches and crown) was converted to tons carbon by multiplying the weighted average carbon factor.

Table 26: Re-growth Model										
Re-Growth per Forest Type (in m^3/ha)										
Year	1	2	3	4	5	6	7	8	9	10
Re-growth of Deciduous Species (in m3/ha)	1.3	1.3	1.3	1.3	1.3	1.5	1.5	1.5	1.5	1.5
Re-growth of Conifers (in cbm/ha)	1.3	1.3	1.3	1.3	1.3	1.7	1.7	1.7	1.7	1.7
Source: Fragments of reforestation dynamics in Korean pine stands after industrial logging" by A.A. Dorofeeva, Collection work of the Far East Forestry Research Institute, edition 12, Khabarovsk, 1974.										
Calculation of the Weighted Average Re-growth of the Project Area										
% - Re-growth Confers (in m3/ha/yr)	1.12	1.12	1.12	1.12	1.12	1.46	1.46	1.46	1.46	1.46
% - Re-growth Other Species (in m3/ha/yr)	0.18	0.18	0.18	0.18	0.18	0.21	0.21	0.21	0.21	0.21
Weighted Average Re-growth (in m3/ha/yr)	1.30	1.30	1.30	1.30	1.30	1.67	1.67	1.67	1.67	1.67
Weighted Average Re-growth including BEF (in m3/ha/yr)	1.81	1.81	1.81	1.81	1.81	2.33	2.33	2.33	2.33	2.33
Weighted Average Re growth (in t.d.m/ha/yr)	0.81	0.81	0.81	0.81	0.81	1.04	1.04	1.04	1.04	1.04
Weighted Average Re-growth (in tC/ha/yr)	0.40	0.40	0.40	0.40	0.40	0.52	0.52	0.52	0.52	0.52

The results show an average re-growth of 0.40 tC/ha/yr for the first five years after logging. Thereafter the re-growth increases to 0.52 tC/ha/yr. In a subsequent step this was multiplied with the annual net harvesting areas. The findings are presented in the table below:

Table 27: Calculation of Re-Growth												
Year	$\bar{G}_{regrowth,t}$ x	Re-Growth Value (tC/yr)										$C_{regrowth,t}$
1	0.40	1,345										1,345
2	0.40	1,345	3,547									4,892
3	0.40	1,345	3,547	3,547								8,440
4	0.40	1,345	3,547	3,547	3,547							11,987
5	0.40	1,345	3,547	3,547	3,547	3,547						15,534
6	0.52	1,730	3,547	3,547	3,547	3,547	3,547					19,467
7	0.52	1,730	4,563	3,547	3,547	3,547	3,547	3,547				24,029
8	0.52	1,730	4,563	4,563	3,547	3,547	3,547	3,547	3,547			28,592
9	0.52	1,730	4,563	4,563	4,563	3,547	3,547	3,547	3,547	3,547		33,155
10	0.52	1,730	4,563	4,563	4,563	4,563	3,547	3,547	3,547	3,547	3,547	37,718

As can be seen from the findings of the table above, the re-growth (in tC/yr) increase from 1,345 tC in year one to 37,718 tC in year 10.

Baseline Activity Emissions. The subsequent section outlines the baseline emissions associated with fuel consumption related to logging operations. This includes emissions from

- Harvesting operations
- Log hauling
- Transportation to the next sawmill, and
- Processing of saw logs.

The project participant decided not to include the baseline emissions of:

- Annual emissions related to trimming and cutting of branches
- Annual emissions related to the distribution of processed wood

Both omissions result in an underestimation of the baseline emissions which is considered to be conservative.

Based on above decisions, formula 3-39 outlines the general approach for the quantification of baseline activity emissions:

$$C'_{emissions,t} = E_{harvest,t} + E_{hauling,t} + E_{transport,t} + E_{processing,t} \quad (3\text{-}39)$$

Parameter	Description	Unit
$C'_{emissions,t}$	Annual total carbon emissions associated with the baseline activity of selective logging operations in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{harvest,t}$	Annual emissions due to harvesting operations such as felling and snigging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e
$E_{hauling,t}$	Annual emissions due to log hauling in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e
$E_{transport,t}$	Annual emissions due to log transport from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e
$E_{processing,t}$	Annual emissions due to electricity consumption in sawmill in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e

In a first step the emissions from harvesting operations are determined following formulae 3-40:

$$E_{harvest,t} = FC_{harvest} \times EF_{fuel} \times V_{merch,t} \quad (3\text{-}40)$$

Parameter	Description	Unit
$E_{harvest,t}$	Annual emissions due to harvesting operations such as felling and snigging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e
$FC_{harvest}$	Fuel consumption of equipment employed for felling and snigging per m3 of merchantable log harvested	$kl\ m^{-3}$
EF_{fuel}	Fuel emission factor	$tCO2\text{-}e\ kl^{-1}$
$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3

Klvac and Skoupy (2009)[25] indicate a range of harvester fuel consumption. The default values range from 1.28 l/m3 to 1.73 l/m3. In order to determine the emission of harvesting operations, the lowest fuel consumption rate (i.e. 1.28 l/m3) was applied which is considered to be conservative. The fuel emission factor was derived based on IPCC data. The calculation is presented in below table:

Table 28: Default Emission Factors for Off-Road Mobile Machinery/Road Transport			
Diesel Emissions (in kg/TJ)			
Sector	CO2 (in kg/TJ)	CH4 (in kg/TJ)	N2O (in kg/TJ)
Forestry	74,100	4.15	28.6
Source: IPCC 2006, Table 3.3.1			
NCV Diesel (in TJ/kt)			43.33
Source: IPCC 1996, Table 1-3			
Diesel Emissions (in tCO2/t)			
CO2 Emissions (in tCO2/t Diesel)	CH4 Emissions (in tCH4/t Diesel)	N2O Emissions (in tN2O/t Diesel)	
3.2108	0.0002	0.0012	
Density (in t/kL)		0.83	
Diesel Emissions (in tCO2-, CH4 and N2O/kl)			
CO2 Emissions (in tCO2/kl Diesel)	CH4 Emissions (in tCH4/kl Diesel)	N2O Emissions (in tN2O/kl Diesel)	
2.6649	0.0001	0.0010	
Global Warming Potential			
CO2	CH4	N2O	
1	21	276	
Diesel Emissions (in tCO2e/kl)			
CO2	CH4	N2O	**tCO2e/kl**
2.6649	0.0031	0.2839	**2.9519**

As can be seen in the table above, the default emission factor for off-road mobile machinery amounts to 2.9519 tCO2e/kl. Based on the diesel emission factor, the harvester fuel consumption and based on the logging volumes indicated in Table 4, the harvesting emissions amount $E_{harvest,t=1}$ amounts to 507 tCO2/yr and $E_{harvest,t>1}$ amounts to 1,422 tCO2e/yr.

The emissions for hauling are calculated based on formula 3-43:

$$E_{hauling,t} = FC_{hauling} \ x \ EF_{fuel} \ x \ V_{merch,t} \quad (3\text{-}43)$$

Parameter	**Description**	**Unit**
$E_{hauling,t}$	Annual emissions due to log hauling in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e
$FC_{hauling}$	Fuel consumption of equipment for hauling one m3 of merchantable log	kl m^{-3}
EF_{fuel}	Fuel emission factor	tCO2-e kl^{-1}

[25] Characteristic fuel consumption and exhaust emissions in fully mechanized logging operations. Journal of Forest Research, 14 (6), 328-334

$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3

In order to determine the fuel consumption for hauling, data from Primorsky GOK was collected. Promorsky GOK is a commercial logging company operating in forest sites next to the Bikin NHZ. Its machinery is well maintained. Primorsky GOK operates a classic tractor (model TT-4M) for hauling. The fuel consumption depends on the season and ranges from 2.061 l/cbm (in summer) to 2.50 l/cbm in winter. The lowest value provided was applied.

For the loading of logs onto trucks, two types of machines are used by Primorsky GOK:

- URAL 4320 with a so-called hydro manipulator, or
- Locomo 990 (which is a modified harvester)

The fuel consumption of URAL 4320 ranges from 1.3 l/cbm (summer) to 1.5 l/cbm (winter). The fuel consumption of Locomo 990 ranges from 2.5 l/cbm (winter) to 2.8 l/cbm (summer). In order to determine the emissions from handling and loading of logs, the lowest value was applied (i.e. 1.3 l/cbm).

Based on these two investigations, the total fuel consumption of hauling was determined to amount to 3.361 l/cbm (2.061 l/cbm for hauling and 1.3 l/cbm for handling/loading). This was combined with the emission factor determined in Table 28, 2.9519 tCO_2e/kl. Following this approach results in $E_{hauling,t=1}$ = 1,332 tCO_2/yr and $E_{hauling,t>1}$ = 3,735 tCO_2/yr.

Formulae 3-44 to 3-46 allow for the quantification of emissions arising from truck transport. Please note, these emissions qualify as positive leakage. The JISC explicitly constrains the consideration of leakage for LULUCF projects to negative leakage (JISC18, Guidance of Criteria for Baseline Setting and Monitoring, §17). Hence, these emissions are calculated but are not accounted for in the overall calculation of emission reductions. I.e. they do not increase the ex-ante and ex-post volume of ERUs.

Formula 3-44 is used to determine the numbers of truck tours required to transport the merchantable volume to the processing facility.

$$N_{trucks-transport,t} = \frac{V_{merch,t}}{Cap_{truck}} \qquad (3\text{-}44)$$

Parameter	Description	Unit
$N_{trucks-transport,t}$	Number of truck trips required for log transport from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	truck
$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3
Cap_{truck}	Truck load capacity	m^3 truck-1

Primorsky GOK, which is again used as a reference, uses trucks of the type KAMAZ 4310 which are common in Russia. KAMAZ 4310 has an average capacity of 22 cbm[26]. Based on the merchantable volume presented in Table 4, this results in $N_{trucks-transport,t=1}$ = 6,103 and $N_{trucks-transport,t>1}$ = 17,110.

[26] Source: www.lifting-machine.com/en/specteh/lesovozy/tok70.php, accessed at the 2nd November 2011.

The total transport distance of all trucks employed under the baseline case is determined following formula 3-45:

$$km_{transport-total,t} = km_{transport,t} \; x \; N_{trucks-transport,t} \; x \; \mathbf{2} \qquad (3.45)$$

Parameter	Description	Unit
$km_{transport-total}$	Annual total log transport distance in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	km
$km_{transport,t}$	Annual log transport distance from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	km truck-1
$km_{transport,t}$	Number of truck trips required for log transport from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	truck
2	Constant, indicating return trip	dimensionless

Following discussions with WWF-Russia, Amur Branch forestry experts, there would be three reasonable destinations for processing logs stemming out of the Bikin. The options are

- Transport to Vladivostok, or
- Transport to Khabarovsk, or
- Transport to Dalnerechensk

Dalnerechensk is a small town, where 'Les Export' constructed a saw mill and a port for exporting the sawn wood to other countries. According to the expert statement of Denis Smirnov and Evgeny Lepeshkin (both WWF Russia, Amur Branch) this would be the most likely destination of saw logs. Dalnerechensk is not only the most likely destination, but it is also the nearest destination. The distance between Krasny Yar (village at the entrance into the Bikin) to Dalnerechensk amounts to 218km.
Consequently, the transportation distance was determined to be 218km which is considered to be conservative. Using this value, and applying the merchantable volume laid out in Table 4 results in kmtransport-total,t=1 = 2,6600,978 and kmtransport-total,t>1 = 7,460,162.

Finally the emissions of transportation are determined following formulae 3-46:

$$E_{transport,t} = \frac{km_{transport-total,t}}{Eff_{vehicle}} \; x \; EF_{fuel} \qquad (3\text{-}46)$$

Parameter	Description	Unit
$E_{transport,t}$	Annual emissions due to log transport haulage from felling location to the collection depot/ sawmill in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e
$km_{transport-total}$	Annual total log transport distance in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	km
$Eff_{vehicle}$	Fuel efficiency for vehicle type	km kl^{-1}
EF_{fuel}	Fuel emission factor	tCO2-e kl^{-1}

Following the information provided by Primorsky GOK, the average fuel consumption by KAMAZ 4310 amounts to 30l/100km. This results in an $Eff_{vehicle}$ of 3,333 km/kl. Following the emission factor determined in Table 28 and applying the findings of formulae 3-44 and 3-45 results in $E_{transport,t=1}$ = 2,357tCO2e and $E_{transport,t>1}$ = 6,607 tCCO2e.

Formulae 3-47 and 3-48 are used to determine the emissions of wood processing. Formula 3-47 was followed to calculate the annual electricity consumption of wood processing:

$$Q_{processing,t} = V_{merch,t} \ x \ e_{demand} \quad (3\text{-}47)$$

Parameter	Description	Unit
$Q_{processing,t}$	Annual quantity of electricity consumption for processing in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	kWh
$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3
e_{demand}	Electricity demand for processing per volume processed	kWh m^{-3}

In order to determine the electricity demand for processing wood, no specific data could be collected from Primorsky GOK. The applied methodology proposes three default values ranging from 20 to 41kWh/m3 (Appendix B7). In order to determine the electricity consumption, the lowest of the three values was applied (i.e. 20kWh/m3). Following the merchantable volume presented in Table 4, this results in $Q_{processing,t=1}$ = 2,685,400 kWh/yr and $Q_{processing,t>1}$ = 7,528,600 kWh/yr.

Formula 3-48 finally allows for determining the actual emissions resulting of the electricity consumption of wood processing:

$$E_{processing,t} = Q_{processing,t} \ x \ EF_{electricity} \quad (3\text{-}48)$$

Parameter	Description	Unit
$E_{processing,t}$	Annual emissions due to electricity consumption in sawmill in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO2-e
$Q_{processing,t}$	Annual quantity of electricity consumption for processing in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	kWh
$EF_{electricity}$	Electricity emission factor for the host country	tCO2-e kWh^{-1}

Vladivostok is powered by two coal power plants. Saw mills in remote areas may eventually feature diesel generators to supply electricity or as a back-up. As Diesel features a higher emission factor than coal, the emission factor of coal was used.

Table 29: Calculation of the Grid Emission Factor

Coal Emissions (in kg/TJ)			
Sector	CO2 (in kg/TJ)	CH4 (in kg/TJ)	N2O (in kg/TJ)
Electricity Generation	98,300	1	1.5
Source: IPCC 2006, Table 2.2			
NCV (in TJ/kt)		18.58	
Source: IPCC 1996, Table 1-2, Russia specific value			
Coal Emissions (in tCO2/t)			
CO2 Emissions (in tCO2/t Coal)	CH4 Emissions (in tCH4/t Coal)	N2O Emissions (in tN2O/t Coal)	

1.8264	0.0000	0.0000
Coal Emissions (in tCO2-, CH4 and N2O/t)		
CO2 Emissions (in tCO2/t Coal)	CH4 Emissions (in tCH4/t Coal)	N2O Emissions (in tN2O/t Coal)
1.8264	0.0000	0.0000
Global Warming Potential		
CO2	CH4	N2O
1	21	276

Coal Emissions (in tCO2e/t)			
CO2	CH4	N2O	tCO2e/t
1.8264	0.0004	0.0077	1.8345

Electricity Generation	
NCV (in TJ/t)	0.02
Conversion Factor TJ to MWh	277.78
NCV (in MWh/t)	5.16
Average Efficiency for Coal fired Electricity Generation	0.33
Source: NPC,2007, Global Oil & Gas Study - Electricity Generation	
Net Electricity Generation (in MWh/t)	1.70
Coal Consumption for Electricity Generation (in t coal/MWh)	0.59
CO2e Emissions of Electricity Generation (in tCO_2/MWh)	**1.0771**

Following above calculation, the grid emission factor of Primorsky krai amounts to 1.0771 t/MWh. This allows for determining $E_{processing,t=1}$ = 2,892 tCO2 and $E_{processing,t>1}$ = 8,109 tCO2. Please note, these emissions qualify as positive leakage. The JISC explicitly constrains the consideration of leakage for LULUCF projects to negative leakage (JISC18, Guidance of Criteria for Baseline Setting and Monitoring, §17). Hence, these emissions are calculated but are not accounted for in the overall calculation of emission reductions. I.e. they do not increase the ex-ante and ex-post volume of ERUs.

The total emissions (i.e. excluding emissions from processing and truck transport (to be considered as positive leakage) arising from baseline activities are presented in Table 30.

Table 30: Baseline Activity Emissions

Year	$E_{processing,t}$	$E_{transport,t}$	$E_{harvest,t}$	$E_{hauling,t}$	$C'_{emissions,t}$
1			507	1,332	1,839
2			1,422	3,735	5,157
3			1,422	3,735	5,157
4			1,422	3,735	5,157
5			1,422	3,735	5,157
6			1,422	3,735	5,157
7			1,422	3,735	5,157
8			1,422	3,735	5,157
9			1,422	3,735	5,157
10			1,422	3,735	5,157

Covering the baseline activity emissions completes the evaluation of the baseline emissions. Table 31 below provides a summary of all baseline emissions. The total of baseline emissions amounts to 96,496 tCO2 in year 1 and thereafter increases to 2,603 in year 10.

Table 31: Summary of Baseline Emissions

$$C'_{degradation,t} = \left[(C_{DW_{decay},t} + C_{ltHWP_{oxidation},t} + C_{stHWP_{oxidation},t} + C_{regrowth,t})\ x\ \frac{44}{12}\right] \qquad C'_{baseline,t} = C'_{degradation,t} + C'_{emissions,t}$$

Year t	$C_{DW_{decay},t}$	$C_{ltHWP_{oxidation},t}$	$C_{stHWP_{oxidation},t}$	$C_{regrowth,t}$	$C'_{degradation,t}$	$C'_{emissions,t}$	$C'_{baseline,t}$
1	1,358	5,302	20,501	1,345	94,657	1,839	96,496
2	5,090	28,371	33,508	4,892	227,614	5,157	232,771
3	8,612	28,875	33,508	8,440	229,367	5,157	234,524
4	11,935	29,367	33,508	11,987	230,350	5,157	235,507
5	15,071	29,848	33,508	15,534	230,607	5,157	235,764
6	18,031	30,318	33,508	19,467	228,764	5,157	233,921
7	20,823	30,778	33,508	24,029	223,959	5,157	229,116
8	23,459	31,227	33,508	28,592	218,538	5,157	223,696
9	25,946	31,666	33,508	33,155	212,537	5,157	217,694
10	28,293	32,094	33,508	37,718	205,985	5,157	211,142

Quantification of Project Emissions. In a next step, the project emissions are quantified. The evaluation covers the following emissions:

- Emissions of project planning
  The applied VCS methodology features three modules: project planning, project design as well as a module for project monitoring. All three modules All modules feature calculations of the emissions of ground transport as well as the emissions of flight transport.
  In order to have a consistent and easily verifiable approach, all emissions of ground transport and all emissions of flight transport (i.e. personnel transport by airlines) are accounted for under the project planning module.

  Ground transport- and flight transport emissions (i.e. personnel transport by airlines) are already accounted for under the project planning module. Consequently this module only accounts for flight emissions due to fire fighting and control by a helicopter.
- Emissions of natural disturbance of forest sites located in the project area
- Emissions due to illegal harvesting.

The tool for testing the significance of GHG emissions in A/R CDM project activities will be applied. It will be shown that the emissions of project planning and the emissions of project monitoring may be neglected.

The overall approach for the quantification of project emissions is laid out in formula 4-1:

$$C'_{actual,t} = E_{proj-plan,t} + E_{design,t} + E_{monitoring,t} + \left[\left(C_{nat-disturb,t} + C_{illegal_{harvest},t}\right) x \frac{44}{12}\right] \quad (4\text{-}1)$$

Parameter	Description	Unit
$C'_{actual,t}$	Annual total carbon emissions associated with the project activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{proj-plan,t}$	Annual emissions due to administration and project planning in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{design,t}$	Annual emissions from travel for design and set up in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{monitoring,t}$	Annual emissions due to monitoring for field work in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C_{nat-disturb,t}$	Annual carbon losses due to natural disturbance(s) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{illegal_{harvest},t}$	elapsed since the start of the IFM-LtPF project activity)	tC
$\frac{44}{12}$	The ratio of molecular weight of carbon dioxide to carbon, see Appendix C	tCO2-e tC^{-1}

Emissions from Project Planning. In a first step, the emissions of project planning are determined. Following formula 4-2, this comprises emissions from administration and emissions from travelling:

$$E_{proj-plan,t} = E_{admin,t} + E_{plan-travel,t} \qquad (4\text{-}2)$$

Parameter	Description	Unit
$E_{proj-plan,t}$	Annual emissions due to administration and project planning in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{admin,t}$	Annual emissions due to electricity consumption required for administration of the project activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{plan-travel,t}$	Annual emissions due to travel for project planning in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

Formula 4-4 allows for the quantification of the emissions due to electricity consumption.

$$E_{admin,t} = Q_{admin,t} \; x \; EF_{electricity} \qquad (4\text{-}4)$$

Parameter	Description	Unit
$E_{admin,t}$	Annual emissions due to electricity consumption required for administration of the project activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$Q_{admin,t}$	Annual electricity consumption due to administration of the project activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	kWh
$EF_{electricity}$	Electricity emission factor for the host country	tCO_2-e kWh^{-1}

The project is administered from WWF Russia, Amur Branch office which is based in Vladivostok. For simplicity, the office's total annual electricity consumption is considered, even through the office (and its staff) covers also other tasks. This approach is considered to be conservative.
The office's annual electricity consumption amounts to 39,320 kWh for 2009 and 39,160 for 2010. For the ex-ante estimation, it is assumed that the annual electricity consumption amounts to 39,320 kWh/yr.
In order to evaluate the overall emissions form electricity consumption, this figure was combined with the Grid Emission Factor of Primorski krai. The GEF amounts to 1.0771 tCO2/MWh (Please refer to Table 29).This results in annual total emissions of $E_{admin,t}$ = 42 tCO2e.

The project emissions due to travel will accounted for emissions due to ground transport and emissions due to air travel following formula 4-5:

$$E_{plan-travel,t} = E_{plan-flight,t} + E_{plan-ground,t} \qquad (4\text{-}5)$$

Parameter	Description	Unit
$E_{plan-travel,t}$	Annual emissions due to travel for project planning in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{plan-flight,t}$	Annual emissions due to flights in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{plan-ground,t}$	Annual emissions due to ground transportation in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

The emissions for flights will be determined following formula 4-6:

$$E_{plan-flight,t} = \sum_{y=1}^{y} \left(KM_{plan-flight,y,t} \ x \ N_{plan,flight,y,t} \ x \ EF_{flight,y} \right) \qquad (4\text{-}6)$$

Parameter	Description	Unit
$E_{plan-flight,t}$	Annual emissions due to flights in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$KM_{plan-flight,y,t}$	Annual number of passengers per trip y, (where y=1,2,3 ... Y trips) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	passenger
$N_{plan,flight,y,t}$	Flight emission factor for trip, y (where y=1,2,3 ... Y trips)	tCO_2-e (passenger.km)$^{-1}$
$EF_{flight,y}$	Annual distance travelled per trip y, (where y=1,2,3 ... Y trips), in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	km

In order to account for flight emissions, a flight emission log was developed. Standard emission factors for sort-, (i.e. up to 1,000km), medium-, (i.e. 1,001-5,000km) and long-distance travel (i.e. 5,001km and more) have been taken from Miyoshi and Mason, 2009[27], Table 3 (based on Ross, 2007[28]). The highest

[27] C. Miyoshi and K., J., Mason, 2009: The carbon emissions of selected airlines and aircraft types in three geographic markets. Journal of Air Transport Management.

[28] D. Ross, 2007: GHG emissions resulting from aircraft travel. Carbon Planet, Sydney

values for each distance class were applied, which is considered to be conservative. Additionally, the flight log features a link to a website which allows for measuring the distance between two destinations. An example of the flight log is given below.

Table 32: Flight Emissions due to Project Planning and Administration					
Emission Factors					
Distance Class I (<1000km) in kgCO2/km	0.45	Distance Class II (1001km - 5000km) in kgCO2/km	0.3	Distance Class III (>5001km) in kgCO2/km	0.32
Flight Log					
Name	Origin	Destination	Distance (in km)	Date	Emissions
Lepeshkin	Vladivostok	Moscow	6,423	15.06.2009	2.06
Lepeshkin	Frankfurt	Moscow	2,055	14.07.2009	0.62
Lepeshkin	Moscow	Vladivostok	6,423	17.08.2009	2.06
Lepeshkin	Vladivostok	Moscow	6,423	17.08.2009	2.06
Lepeshkin	Moscow	Vladivostok	6,423	17.07.2009	2.06
Lepeshkin	Frankfurt	Moscow	2,055	14.07.2009	0.62
	Moscow	Frankfurt	2,055		0.62
Kabanets	Moscow	Vladivostok	6,423	16.05.2010	2.06
	Vladivostok	Moscow	6,423		2.06
Zherebkin	Moscow	Vladivostok	6,423	16.05.2010	2.06
	Vladivostok	Moscow	6,423		2.06
Lepeshkin	Vladivostok	Moscow	6,423	03.03.2010	2.06
	Moscow	Vladivostok	6,423		2.06
Lepeshkin	Moscow	New York	7,505	05.03.2010	2.40
	New York	Moscow	7,505		2.40
Conversion km to miles		1.852			27.21
Distance Calculator	http://www.geobytes.com/CityDistanceTool.htm?loadpage				
Source: Miyoshi et al 2009, Table 3, based on Ross (2007) (highest value applied)					

The flight log will be filled out for the ex-post determination of flight emissions. For the ex-ante estimate of the project emissions, annual emissions of 40 tCO2/yr were considered.

Formula 4-8 allows for the quantification of the ground emissions:

$$E_{plan-ground,t} + \sum_{y=1}^{y}(V_{fuel-plan-ground,y,t}\ x\ EF_{fuel}) \qquad (4\text{-}8)$$

Parameter	**Description**	**Unit**
$E_{plan-ground,t}$	Annual emissions due to ground transportation in year t,	tCO_2-e

	(where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	
$V_{fuel-plan-ground,y}$	Annual volume of fuel consumed per trip y, (where y=1,2,3 ... Y trips), in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	kL
EF_{fuel}	Fuel emission factor	tCO_2-e kl^{-1}

The ground transport will cover emissions of all cars operated by WWF Russia, Amur Branch for the project. These are cars running both on diesel and gasoline.
The emission factor of diesel was already determined in Table 28. It amounts to 2.9519 tCO_2/kL.
The emissions factor of gasoline amounts to 2.4612 tCO_2e/kL and is determined based on IPCC default factors in the below table.

Table 33: Default Emission Factors for Gasoline Road Transport

Gasoline Emissions (in kg/TJ)			
Sector	CO2 (in kg/TJ)	CH4 (in kg/TJ)	N2O (in kg/TJ)
Road Transport	69,300	4.15	28.6
Source: IPCC 2006, Table 3.3.1			
NCV (in TJ/kt)			44.8
Source: IPCC 1996, Table 1-3			
Gasoline Emissions (in tCO2/t)			
CO2 Emissions (in tCO2/t Gasoline)	CH4 Emissions (in tCH4/t Gasoline)	N2O Emissions (in tN2O/t Gasoline)	
3.0028	0.0002	0.0012	
Density (in t/kL)		0.735	
Gasoline Emissions (in tCO2-, CH4 and N2O/kL)			
CO2 Emissions (in tCO2/kL Gasoline)	CH4 Emissions (in tCH4/kL Gasoline)	N2O Emissions (in tN2O/kL Gasoline)	
2.2070	0.0001	0.0009	
Global Warming Potential			
CO2	CH4	N2O	
1	21	276	
Gasoline Emissions (in tCO2e/kL)			
CO2	CH4	N2O	**tCO_2e/kl**
2.2070	0.0028	0.2514	**2.4612**

In order to provide a valid ex-ante estimate about the actual diesel- and gasoline consumption, the actual fuel consumption of WWF Russia, Amur Branch, for this specific project was collected and an average was determined. The actual fuel consumption amounts to 7 kl diesel and 2 kl gasoline.
Based on above determined emission factors, the total emissions of fuel consumption amounts to 25.9 tCO_2/yr. This is used for the ex-ante calculation of the project emissions due to ground transport.

Table 34: Ex-ante Estimate of Fuel Consumption and Emissions by Fuel Type

Consumption		
Year	Diesel (kl)	Gasoline (in kl)
2009 and 2010	11	4
per Year	7	2

Emissions (in tCO_2e)		
per Year	20.0	5.9

The total of emissions from project planning amounts to 108 tCO2/yr (ex-ante estimate). This amounts to 0.64% of the project emissions and to 0.1% of the project's overall emission reductions. Based on tool for testing the significance of GHG emissions in A/R CDM project activities, the project emissions from project planning are to be classified as insignificant and may be neglected.

Emissions from project monitoring. As indicated above (beginning of the project emission section), all ground transport- and personnel flight emissions are accounted for under the 'Emissions due Project Planning' module. Hence, the quantification of monitoring emissions is reduced to flight emissions for fire fighting and monitoring.
Tribal Commune Tiger and WWF Russia, Amur Branch made an agreement with the Forest Department of Primorsky Krai, that the Forest Department will conduct regular control flights with a fire fighting helicopter. Moreover, if forest fires are detected, the Forest Department will use the helicopter for firefighting purposes. The related emissions are accounted for under formula 4-12:

$$E_{monitoring,t} = E_{monitoring-flight,t} \quad (4\text{-}12)$$

Parameter	Description	Unit
$E_{monitoring,t}$	Annual emissions due to monitoring for field work in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{monitoring-flight,t}$	Annual emissions due to air travel for monitoring team in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

The actual emissions of monitoring activities are constrained to fuel consumption from flights, 4-13:

$$E_{monitoring-flight,t} = V_{firefighting,t} \times EF_{fuel} \quad (4\text{-}13)$$

Parameter	Description	Unit
$E_{monitoring-flight,t}$	Annual emissions due to air travel for monitoring team in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$V_{firefighting,t}$	Annual volume of fuel consumed per trip y, (where y=1,2,3 ... Y trips), in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	kl
EF_{fuel}	Fuel emission factor	tCO_2-e kl^{-1}

These flights are undertaken by:
- Helicopter (Model MI-2) which consumes kerosene, and
- Plane (Model AN-2) which consumes aviation gasoline.

The emission factors of kerosene and aviation gasoline are calculated in the subsequent tables:

Table 35: Default Emission Factors for Kerosene			
Kerosene Emissions (in kg/TJ)			
Sector	CO2 (in kg/TJ)	CH4 (in kg/TJ)	N2O (in kg/TJ)
Flight	71,500	0.5	2
Source: IPCC 2006, Table 3.6.4 and IPCC 2006, Table 3.6.5			
NCV (in TJ/kt)			44.59
Source: www.exxonmobil.com/AviationGlobal/Files/WorldJetFuelSpec2008_1.pdf			
Kerosene Emissions (in tCO2/t)			
CO2 Emissions (in tCO2/t Gasoline)	CH4 Emissions (in tCH4/t Gasoline)	N2O Emissions (in tN2O/t Gasoline)	
3.0981	0.0000	0.0001	
Density (in t/kL)		0.7975	
Kerosene Emissions (in tCO2-, CH4 and N2O/kL)			
CO2 Emissions (in tCO2/kL)	CH4 Emissions (in tCH4/kL)	N2O Emissions (in tN2O/kL)	
2.4707	0.0000	0.0001	
Global Warming Potential			
CO2	CH4	N2O	
1	21	276	
Kerosene Emissions (in tCO2e/kL)			
CO2	CH4	N2O	**tCO2e/kL**
2.4707	0.0004	0.0191	**2.4902**

Table 36: Default Aviation Gasoline Emissions			
Aviation Gasoline Emissions (in kg/TJ)			
Sector	CO2 (in kg/TJ)	CH4 (in kg/TJ)	N2O (in kg/TJ)
Flight	69,300	0.5	2
Source: IPCC 2006, Table 3.6.4 and IPCC 2006, Table 3.6.5			
NCV (in TJ/kt)			43.5
Source: www.exxonmobil.com/AviationGlobal/Files/WorldJetFuelSpec2008_1.pdf			
Aviation Gasoline Emissions (in tCO2/t)			
CO2 Emissions (in tCO2/t Gasoline)	CH4 Emissions (in tCH4/t Gasoline)	N2O Emissions (in tN2O/t Gasoline)	
3.0028	0.0000	0.0001	
Density (in t/kL)		0.721	
Aviation Gasoline Emissions (in tCO2-, CH4 and N2O/kL)			
CO2 Emissions (in tCO2/kL)	CH4 Emissions (in tCH4/kL)	N2O Emissions (in tN2O/kL)	
2.1650	0.0000	0.0001	
Global Warming Potential			

CO2		CH4		N2O
1		21		276
Aviation Gasoline Emissions (in tCO2e/kL)				
CO2	CH4	N2O	**tCO2e/kL**	
2.1650	0.0003	0.0172	**2.1826**	

As can be seen from the table above, the emission factor of kerosene amounts to 2.492 and the emission factor of aviation gasoline to 2.1826 tCO2/kL. The annual volume of fuel consumption for control flights in the project area will be monitored and the related emissions will be accounted for as project emissions. In order to provide an ex-ante estimate, it is assumed that the fuel consumption of the helicopter amounts to 20 kL/yr.
The total of emissions from project planning amounts to 22 tCO2/yr (ex-ante estimate). This amounts to 0.13% of the project emissions and to 0.04% of the project's overall emission reductions. Based on tool for testing the significance of GHG emissions in A/R CDM project activities, the project emissions from project planning are to be classified as insignificant and may be neglected.

Emissions Due to Natural Disturbances. The project will account for project emissions due to natural disturbances such as forest fires or diseases. The annual calculation of the emissions due to natural disturbances follows formula 4-15:

$$C_{AGB-ND,j,t} = \left[\bar{V}_{gstock,j,t=0} \ x \ BCEF_j \ x \left(\sum_{ND=1}^{ND} A_{ND,j,t} \right) \right] x \ CF_{AGB} \qquad (4\text{-}15)$$

Parameter	Description	Unit
$C_{AGB-ND,j,t}$	Annual carbon in the aboveground biomass of the growing stock in the naturally disturbed area in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{V}_{gstock,j,t=0}$	Average growing stock per hectare for stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	$m^3 ha^{-1}$
$A_{ND,j,t}$	Annual area of natural disturbance ND, (where ND=1,2,3 ... ND naturally disturbed areas) in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	Ha
$BCEF_j$	Biomass conversion and expansion factor for converting growing stock to carbon in the aboveground biomass for stratum j, (where j=1,2,3 ... J strata)	(t d.m.) m^{-3}
CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest (see Appendix B)	tC (t d.m.)$^{-1}$

The following parameters were used:The table below presents information for the ex-ante assessment of emissions of forest fires. It shows the forest units, the area burnt, the total biomass of the area burnt (prior to the fire) and the burnt volume, for a time period of seven years. Based on this information, the A_{ND} and f_{ND} was determined.

- The total burnt area amounts to 123.9ha over a time period of seven years. This was divided by 7 to calculate the area burnt per year. The A_{ND} hence amounts to 17.7ha.
- f_{ND} (used in equation 4-16 below) was determined as follows: The total amount of biomass of all burnt areas was determined. This amounts to 28,172m3. The volume burnt of all burnt areas was

determined. This amounts to 4,092m3. Dividing the burnt volume by the total volume results in f_{ND}.

- The BCEF was calculated based on the weighted average BEF times the weighted average density factor and amounts to 0.62 t.d.m/m3.
- As discussed above, the weighted average carbon fraction of the project area was applied; it amounts to 0.50 tC/t.d.m.
- As discussed above, the average growing stock amounts to 226m3/ha.
- The annual area of disturbance was taken from below analysis. The historical data on natural disturbances in the project area was provided by the Far East Forestry Research Institute. The table shows that the average annual burnt area amounts to 17.7ha.

Based on this input parameters, $C_{AGB\text{-}ND,t}$ = 1,246 tC/yr.

Table 37: Calculation of Average Annual Forest Fires Losses

Year	Forest unit	Burned Area, ha	Compart-ment	Volume (in m^3/ha)	Total Volume of Area Burnt (in m^3)	Volume Burnt (in m^3)
2008	Krasnoyarovskoe	4.5	118	250	1,125	394
	Ohotnichye	3.0	448	103	309	62
	Ohotnichye	3.5	488	221	774	271
2007	Krasnoyarovskoe	1.5	153	281	422	211
2006	Krasnoyarovskoe	8.0	215	278	2,224	778
	Krasnoyarovskoe	8.0	217	192	1,536	77
	Krasnoyarovskoe	1.5	198	231	347	87
2005	Krasnoyarovskoe	0.9	378	244	220	77
2004	N.A.	0.0	N.A.	0	-	-
2003	Ohotnichye	0.4	704	217	87	30
	Ohotnichye	10.0	499	178	1,780	178
	Krasnoyarovskoe	1.1	372	254	279	168
	Krasnoyarovskoe	1.0	331	268	268	94
	Krasnoyarovskoe	60.0	278	234	14,040	-
	Krasnoyarovskoe	20.0	198	231	4,620	1,617
	Krasnoyarovskoe	0.5	141, 154	285	143	50
2002	N.A.	0.0	N.A.	0	-	-
Annual Average		17.7			28,172	4,092
Source: Data provided by the Far East Forestry Research Institute					0.145	511.55

In a next step the annual carbon losses of AGB due to natural diseases are determined following formula 4-16:

$$C_{AGB,ND,t} = \sum_{j=1}^{J} (C_{AGB-ND,j,t} \ x \ f_{ND,j,t}) \qquad (4\text{-}16)$$

Parameter	Description	Unit
$C_{AGB,ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

$C_{AGB-ND,j,t}$	Annual carbon in the aboveground biomass of the growing stock in the naturally disturbed area in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$f_{ND,j,t}$	Fraction of the growing stock naturally damaged in stratum j (where j = 1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	dimensionless

The following input parameters were used:

- $f_{ND,t}$ was calculated based on Table 37 and amounts to 14.5%.
- the total carbon stocks of areas affected by forest fires was determined based on formula 4-15 and amounts to 1,246 tC.

Based on the above input parameter, the annual carbon loss due to natural disturbances amount to 192 tC/yr. This value was used for the ex-ante estimation of the project emissions.

Formula 4-17a was followed to estimate the re-growth of areas disturbed:

$$C_{regrowth-ND,t} = CF_{AGB} \; x \sum_{j=1}^{J}\left[\sum_{ND=1}^{ND}\left(A_{ND,j,t}\right) x \; \bar{G}_{regrowth,ND,j,t}\right] \qquad (4\text{-}17a)$$

Parameter	Description	Unit
$C_{regrowth-ND,t}$	Annual carbon increase due to the regrowth in the naturally disturbed area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest (see Appendix B)	$tC\ (t\ d.m.)^{-1}$
$A_{ND,j,t}$	Annual area of natural disturbance nd, (where nd=1,2,3 ... ND naturally disturbed areas) in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)^^	ha
$\bar{G}_{regrowth,ND,j,t}$	Average regrowth per hectare per year in the aboveground biomass after natural disturbance in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	$(t\ d.m.)\ ha^{-1}\ yr^{-1}$

In order to provide a qualified ex-ante estimate of the carbon stored due to re-growth after natural disturbances, the findings of Table 26 were used. This was combined with the annual area of natural disturbance. The findings are presented in the table below.

Year	$\bar{G}_{regrowth,ND,t}$ x	**Table 38: Re-Growth after Natural Disturbance Calculation**					$C_{regrowth-ND,t}$
1	0.40	7					7
2	0.40	7	7				14
3	0.40	7	7	7			21
4	0.40	7	7	7	7		29
5	0.40	7	7	7	7	7	36

6	0.51	9	7	7	7	7	7					45
7	0.51	9	9	7	7	7	7	7				54
8	0.51	9	9	9	7	7	7	7	7			63
9	0.51	9	9	9	9	7	7	7	7	7		73
10	0.51	9	9	9	9	9	7	7	7	7	7	82

As can be seen from the table above, it is expected that in the first year, the re-growth stores 7 tC increasing to 82 tC in year 10.

Formulae 4-18a to 4-20 allow for the quantification of the N2O- and CH4 emissions of forest fires. Formula 4-18a outlines the approach for the calculation of CH4 emissions:

$$E_{CH_4,t} = C_{AGB-ND,t} \; x \; R_{CH_4} \; x \; \frac{16}{12} \qquad \text{(4-18a)}$$

Parameter	Description	Unit
$E_{CH_4,t}$	Annual emissions due to CH4 in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCH_4
$C_{AGB-ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
R_{CH_4}	Emission ratio for CH4	dimensionless
$\frac{16}{12}$	The ratio of molecular weight of CH4 to carbon	$tCH_4 \; tC^{-1}$

The following input parameters were used:

- An emission ratio of 0.012 for CH_4 was used (IPCC, 2003, Table 3A.1.15).
- The annual carbon losses in AGB were determined above and amount to 181 tC/yr.

This approach results in an ex-ante estimate of CH_4 emissions of 3 tCH_4/yr.

Formula 4-18b was applied to calculate the emissions from N_2O due to forest fires:

$$E_{N_2O,t} = C_{AGB-ND,t} \; x \; R_{\frac{N}{C}} \; x \; R_{N_2O} \; x \; \frac{44}{28} \qquad \text{(4-18b)}$$

Parameter	Description	Unit
$E_{N_2O,t}$	Annual emissions due to N2O in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tN_2O
$C_{AGB-ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$R_{\frac{N}{C}}$	Ratio of nitrogen to carbon	$tN \; tC^{-1}$
R_{N_2O}	Emission ratio for N_2O	dimensionless
$\frac{44}{28}$	The ratio of molecular weight of N_2O to N	$tN_2O \; tN^{-1}$

The following input parameters were used:

- The annual carbon losses in AGB were determined above and amount to 181 tC/yr.
- Ratio of nitrogen to carbon amounts to 0.01 (IPCC, 2003, Table 3A.1.15).
- The emission factor for N_2O amounts to 0.007 (IPCC, 2003, Table 3A.1.15).

This results in annual emissions of 0.02 tN_2O/yr which was used for the ex-ante estimate of the project emissions.

Formula 4-19 allows for converting the N_2O- and CH_4 emissions into tC:

$$C_{CH_4N_2O,t} = \left(E_{CH_4,t} \ x \ GWP_{CH_4} + E_{N_2O,t} \ x \ GWP_{N_2O}\right) x \ \frac{12}{44} \quad (4\text{-}19)$$

Parameter	Description	Unit
$C_{CH_4N_2O,t}$	Annual carbon from CH4 and N2O emissions in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$E_{CH_4,t}$	Annual emissions due to CH4 in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCH_4
GWP_{CH_4}	Global warming potential of CH_4	tCO_2-e $tCH4^{-1}$
$E_{N_2O,t}$	Annual emissions due to N_2O in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tN_2O
GWP_{N_2O}	Global warming potential of N_2O	tCO_2-e tN_2O^{-1}
$\frac{12}{44}$	The ratio of molecular weight of carbon to carbon carbon dioxide, see Appendix C	tC tCO_2-e^{-1}

Using a global worming potential of 1:21 for CH_4 and 1:276 for N_2O (Annex A of the Kyoto protocol) allows to estimate the total ex-ante emissions to 18 tC/yr.

Formula 4-20 finally quantifies the total emissions of natural disturbances.

$$C_{natdisturb,t} = \sum_{t=1}^{t}\left(C_{AGB-ND,t} - C_{regrowth-ND,t} + C_{CH_4N_2O,t}\right) \quad (4\text{-}20)$$

Parameter	Description	Unit
$C_{natdisturb,t}$	Annual total carbon losses due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{AGB-ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{regrowth-ND,t}$	Annual carbon increase due to the regrowth in the naturally disturbed area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{CH_4N_2O,t}$	Annual carbon from CH4 and N2O emissions in year t, (where t=1,2,3 ... t* years elapsed since the start of the	tC

	IFM-LtPF project activity)	

Based on the input parameter discussed above (and using the re-growth of year 1) results in an ex-ante estimate of the total emissions from natural disturbances in the amount of 192 tC/yr.

Finally, the emissions due to illegal logging are calculated based on formula 4-21

$$C_{illegal-harvest,t} = V_{illegal-harvest,t} \; x \; (1 + f_{RSD}) \; x \; BEF \; x \; D \; x \; CF_{AGB} \qquad (4\text{-}21)$$

Parameter	Description	Unit
$C_{illegal-harvest,t}$	Annual carbon losses due to illegal harvesting in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$V_{illegal-harvest,t}$	Annual volume of wood sold as determined from field surveys in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	m^3
BEF	Biomass expansion factor for converting volume of extracted roundwood to total aboveground biomass (including bark)	(t d.m.) m^{-3}
D	Wood density for the forest with corresponding climate region and ecological zone	(t d.m.) m^{-3}
CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest	tC (t d.m.)$^{-1}$
f_{RSD}	Factor for residual stand damage, based on the fraction of quantity of carbon damaged in the residual stand to the quantity of carbon in the total merchantable logs harvested	Dimensionless

The following input parameters were used:

- The illegal logging was estimated to 70 m^3/yr. This figure was provided by WWF Russia, Amur Branch based on the first detections of illegal logging in the project area.
- As discussed above, the residual stand damage factor amounts to 0.41.
- As discussed above, the weighted average biomass expansion factor amounts to 1.40.
- As discussed above the average density factor amounts to 0.45 t.d.m/m3
- As discussed above, the weighted average carbon fraction amounts to 0.50 tC/t.d.m.

Combining above findings results in annual emissions of 53 tC/yr. This value was used as an ex-ante estimate of the project emissions.

Table 39: Ex-Ante Estimate of Project Emissions						
$C'_{actual,t} = E_{proj-plan,t} + E_{design,t} + E_{monitoring,t} + \left[\left(C_{nat-disturb,t} + C_{illegal_{harvest},t}\right) x \frac{44}{12}\right]$						
Year t	$E_{proj-plan,t}$	$E_{monitoring,t}$	$C_{natdisturb,t}$	$C_{illegal-harvest}$	$C'_{actual,t}$	Leakage
1			192	31	817	18,931
2			192	31	817	45,523
3			192	31	817	45,873
4			192	31	817	46,070
5			192	31	817	46,121

6			192	31	817	45,753
7			192	31	817	44,792
8			192	31	817	43,708
9			192	31	817	42,507
10			192	31	817	41,197

The ex-ante estimate of the project emissions is provided in the above table. A leakage discount factor of 20% of the project's overall emission reduction was applied. The leakage factor is discussed in Section E.4.

B.5. Description of how the definition of the project boundary is applied to the LULUCF project:

The concession is owned by the Russian Federation and, as forest funds in Primorski krai are administered by the Forest Department, was leased by the Forest Department to TCT. In accordance with paragraph 12 JISC 04 Annex 6, the project boundary of the JI LULUCF project geographically delineates and encompasses all anthropogenic GHG emissions by sources and removals by sinks on lands under the control of project participants which are significant[29] and reasonably attributable to the proposed project activity.
The project has a well defined boundary comprising a total forest area of 455,989 ha. This definition is based on the total concession area of 461.154 ha, located in the Pozharsky District, Verkhne-Perevalnenskoe Forestry. The concession comprises the following three Divisional Forestries and related compartments:

- Sobolinoe Divisional Forestry (compartments 68, 107-117),
- Krasnoyarovskoe Divisional Forestry (compartments 118-308, 326-337, 342-407, 409, 413, 417),
- Okhotnichie Divisional Forestry (compartments 309-325, 338-341, 408, 410-412, 414-416, 418-523, 525-530, 537-543, 549-563, 571-575, 589, 590, 593, 594, 598-603, 611-620, 626, 627, 632-656, 663-666, 701-713, 715-717, 719).

The number of the record on the state forest register is 20/1105006-2009-03. Figure 5, in Section A.4.1.4 illustrates the location of the compartments within the divisional forest units.

Within the concession, the definition of forest of the Russian Federation was applied to delineate the project boundary. The host party (Focal Point of the Russian Federation) has decided on the following Kyoto forest definition and elections for Article 3, paragraphs 3 and 4, activities in accordance with decision 16/CMP.1[30]:

- A single minimum tree crown cover value of 18% (equivalent to 30%[31] stocking density)

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[29] Significant, i.e., as a rule of thumb, would by each source account on average per year over the crediting period for more than 1 per cent of the annual average anthropogenic emissions by sources of GHGs, or exceed an amount of 2,000 Mg of CO_2 equivalent, whichever is lower.

[30] Report of the review of the initial report of the Russian Federation. UNFCCC/IRR/2007/RUS of 18.02.2008.

[31] The following sources were considered:
- Taken from the first national communication of the Russian Federation to the UNFCCC (most recent document). Available under
- www./unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/pdf/initial_report_russia.pdf
- This definition is consistent with the initial communication to UNFCCC, page 9, available at www.unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/msword/initial_report_corr_new_rev_mg_an.doc

- A single minimum land area value of 1.0 hectare
- A single minimum tree height value of 5 meters

Additionally, a minimum value of forest width of 20 meters applies.

Russia accounts it emissions from sinks and sources for afforestation, reforestation and deforestation (Article 3.3 of the Kyoto Protocol). Moreover Russia elected to account for sinks and sources from forest management under Article 3.4. Russia will account for the chosen LULUCF sinks and sources annually.

Following above definitions, the concession area was compiled by:

- Excluding all sub-compartments having a stocking density below 30% (633 sub-compartments, 5,260.9 ha)
- Excluding all sub-compartments having a maximum height below 5m (660 sub-compartments, 5,462.2 ha)
- Excluding all sub-compartments having a minimum area below 1 ha (243 sub-compartments with a total area of 124.7ha).

Eliminating the above areas (which are partially overlapping) from the concession area results gives the forest area. The forest area amounts to 455,989ha. This area fulfills all of the above criteria and hence qualifies as forest according to the forest definition of the Russian Federation and falls under the elected activity chosen by the Russian Federation. From the forest area, several small logging plots were subtracted (pls refer to Section A4.1.4 for details) resulting finally in the project area of 450,374ha.

B.6. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

The baseline development was completed at the 4th November 2011.

Mr. Martin Burian, GFA ENVEST, martin.burian@gfa-envest.comf
Mrs. Ekaterina Lysun (external expert), kalyok@yandex.ru

GFA ENVEST is not project participant but WWF Russia, Amur Branch is project participant.

- Any changes to the forest definition shall be reflected to the UNFCCC website www.unfccc.int/national_reports/initial_reports_under_the_kyoto_protocol/items/3765.php
- As there are no changes, the above definition is still applicable.

SECTION C. Duration of the LULUCF project / crediting period

C.1. Starting date of the project:

The starting date of the project is 03/06/2009.

C.2. Expected operational lifetime of the project:

The expected operational lifetime of the project is 49 years and 0 months which is the timeframe of the concession lease. WWF Russia, Amur Branch will continue its efforts for ensuring the permanent protection of the project area e.g. by supporting the application for the inscription in the UNESCO Cultural and Natural World Heritage List.

C.3. Length of the crediting period:

According to the Russian JI Procedures, the crediting period comprises only the first commitment period of the Kyoto Protocol. The starting date is 03/06/2009 and the crediting period covers 3 years and 7 months.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

Step 1. Indication and Description of the Approach Chosen Regarding Monitoring. The monitoring plan of the proposed project is based on the monitoring methodology stipulated in the VCS methodology chosen (VM011). As such, this approach is considered as JI specific approach. The monitoring methodology is in accordance with paragraph 9 (a) of the .Guidance on criteria for baseline setting and monitoring and its description follows §30 of the 'Guidance on criteria for baseline setting and monitoring'

Step 2. Application of the Approach Chosen. The monitoring plan features the following elements:

a) Monitoring of baseline emissions
b) Monitoring of project emissions
c) Monitoring of leakage
d) Annual allowable cut (AAC)

These are summarized in the following section.

a) Monitoring of Baseline Emissions

This monitoring shall demonstrate that the actual forest protection area conforms with the area specified in the PDD. The project boundary will be monitored annually all through the crediting period by means of new inventory information, and through remote sensing as applicable. If the forest area changes during the crediting period, for instance, because deforestation occurs on the project area, the specific location and area of the deforested land shall be identified and the project boundary shall be rectified accordingly. Please also refer to d) Monitoring of AAC for potential changes to allowed logging volumes.

b) Monitoring of Project Emissions

The project emissions shall be monitored based on the following monitoring elements:

- Monitoring of illegal logging
- Monitoring of areas subject to natural disturbance
- Monitoring of fND

The general monitoring approaches are described subsequently:

- **Illegal Logging:**

- **Determination of Volume and Tree Species of Removed Trees.** TCT shall engage an anti-poaching brigade (i.e. not only anti-hunting but also anti-logging) this team frequently patrols the project area and roads in the project area. If illegal logging is detected, the team will determine the GPS points of the illegal logging area, the volume of illegal logging and will write a report comprising the location and volume, This information shall be documented in written and stored by TCT, each a small report. Based on this documentation, the annual volume of illegal logging will be determined. All site specific reports shall be aggregated to one illegal logging report covering the project area.

  The volume will be determined following the standard procedure of volume determination by stamp. This implies the following steps:
  - All tree stumps at the project site shall be identified and quantity of felled trees by species shall be recorded at special blank.
  - Determination of the tree species based on the evaluation of the tree stump.
  - Measurement of the diameter of the tree stump.
  - Finding a DBH by using tables.
  - Estimation of height of Trees is carrying out by following method: Usually illegal loggers only take most valuable piece of stem, and left the rest parts on cutting site, this can help to estimate approximate height, (it is advisable to estimate several stems). In addition to previously estimated height - measurement of neighboring trees shall be done.
  - Based on the diameters, trees height and quantity of felled trees by species, the removed volume can be calculated with use of the volume tables.
- **SOPs:**
  - Frequency: Illegal logging is monitored permanently through engagement of anti-poaching guards (currently 12 guards). The illegal logging report shall be aggregated at least once, for each JI verification. QA/QC steps I and II shall be conducted at least once, for each JI verification.
  - Storage: Finally information on illegal logging from part 1 (reports) and part 2 (remote sensing and additional field work) should be aggregated and stored electronically.
- **QA/QCs:**
  - The reports from the Forestry Units (i.e. at lesnichestvo level) and/or from the Police for the project area shall be collected by TCT. The data shall be crosschecked with the data from anti-poaching brigade and aggregated regarding location (i.e. sub-compartment), size (in ha) and volume (in m3)). If the data is inconsistent, the higher volume shall be applied.
  - The WWF will either conduct or contract a remote sensing analysis for determining development of forest infrastructure. This shall be based on comparing winter to spring images with a minimum resolution of 10m. Images should have a cloud cover ratio of below 20%. Pictures shall be taken in a time period of 5 months or less. The analysis shall have a minimum accuracy of 85% (i.e. with respect to infrastructure development). The analysis shall be conducted at least once for each JI verification.
    - If additional forest infrastructure (not registered by previous raids of anti-poaching brigades) will be determined than the additional field work will be conducted in second phase.

- The second phase will include verifying detected infrastructure development in the field: WWF together with TCT brigade (or/and contracted forest specialists) will conduct field work for verifying all illegal logging, which were not registered by previous raids or by reports of Forest department and Police. Location, size, volume should be collected and reported.

- **Area Natural Disturbances.**
  - The WWF will engage the 'Forest Fire Fighting Service' of the Primorski Krai Administration to conduct regular control flights over the project area combined with regular remote sensing analyses for Russia Far East. This shall allow detecting forest fires.
    The remote sensing analysis is conducted by the Forest Fire Fighting Service in cooperation with the Russian 'Ministry for Emergency'. The approach is based on specialized software, which uses remote sensing data[32]. New images are loaded several times a day. Following the remote sensing approach, GIS layers and digital maps are created which indicate pest activity, forest diseases, and the burnt areas.
    This approach is combined with regular flight controls allow for a quick detection of forest fires. The flights are conducted from late April until October. The actual frequency depends on the weather conditions (i.e. temperature, precipitation and wind). At days featuring high forest fire risk, the control flights are conducted twice a day. The analysis is based on visual interpretation and focuses mainly on a swift response to forest fires.
    This approach will follow the official "*Guideline for the Design, Organization and Management of Forest Pathology Monitoring*" by Rosleskhoz dated 29.12.2007, No 523. The technical approach is described in more detail in Section 2.4, §24 to §50, pages 9-12.
    Based on the contract between WWF and the Forest Fire Fighting Service, the forest will be requested to document the exact areas where forest fires occurred within the project area in a GIS layer. This information will specify the compartment, the sub-compartment, and the burnt area, per sub-compartment. This will be documented, per year will be summarized a written report.
  - SOPs:
    - Frequency: at least for each verification
    - Storage: The reports shall be stored electronically
    - The fire fighting department shall report annually on the burnt areas. The report shall identify the Forestry Units, compartment, sub-compartments where fire occurs and the total area of the burnt area.
  - QA/QC: Reports of Forestry Units (i.e. lesnichestvo level) on fires will be used for determining the burnt areas. If data is inconsistent, the higher (i.e. more conservative) value shall be applied.
- **f_{ND}.** The fraction of natural disturbances will be determined for those areas where natural disturbances have been detected (i.e. $A_{ND,j,t}$)

[32] *Guideline for the Design, Organization and Management of Forest Pathology Monitoring.* Annex 1 of order of Rosleskhoz dated 29.12.2007 # 523, §34 stipulates: "Depending on the aims and objectives of forest pathology monitoring applied different scales (i.e. spatial resolutions) of aerial and/or satellite images, as well as, different types of images, spectral resolutions, timing and periods of monitoring, required technical and software programs for data processing and analysis".

The list of required types of images is presented in table 3, page 10 of above document.

- Measurement of volume of fire damaged area will be conducted by forest specialists (contracted forestry specialists or/and WWF forestry specialists with support of TCT). These specialists shall determine the burnt timber volume in the area of natural disturbance. A sample plot approach will be applied. The damaged vole per sub-compartment shall be calculated.
  Alternatively, if fire damaged area is in-accessible, than the WWF may opt to set the volume of burnt biomass at 100% per sub-compartment and hence f_{ND} at 1.
- **SOPs:**
  - Frequency: at least for each verification
  - Storage: The reports shall be stored electronically in the office of WWF Russia, Amur Branch.
- **QA/QCs:**
  - The analysis will be based on inventory measurements in the disturbed areas. The upper boundary of the 95% confidence interval of biomass lost per tree shall be determined. This value will be used in order to determine f_{ND} in a conservative manner.
  - TCT shall request data on the decrease of volume of the burnt area from forest department (collected by the local forestry unit/lesnichestvo) Forest department (lesnichestvo) report shall identify the compartment, sub-compartments, burnt area and burnt volume of the disturbed area. If the data is inconsistent, the higher burnt volume shall be used for the determination of f_{ND}.

c) Monitoring of Leakage

As outlined in section E4, leakage is unlikely to occur:

- There are very limited areas having high stand volumes of valuable species which are not logged, leased as a timber concession, or classified as protected areas.
- The timber market in Primorski Krai follows the patterns of an inelastic supply function.
- The forest sector primarily produces timber for export in other countries. According to the VCS Requirements, it is not necessary to consider leakage from such activities. Still the proposed project does not take this effect into account for the quantification of leakage, which is very conservative.

Even though the leakage argumentation in Section E.4 shows very limited potentials for market leakage, a default value of 20% is applied. I.e. the project will only claim 80% of its emission reductions, as it assumes that 20% will compensate potential market leakage effects. This is in line with the VCS leakage procedures and is considered to be conservative. Following this approach and the related VCS leakage procedures, the monitoring of leakage is neither required nor foreseen.

d) Monitoring of annual allowable cut (AAC)

The AAC may be adapted if new laws, rules and procedures will be adopted by the Federal Forest Agency (i.e. Rosleskhoz) and/or the Forest Department of Primorsky Krai. If new decisions relating the baseline logging volumes and areas become available, the baseline parameters shall be revaluated and the baseline shall be amended. If this does not occur, the annual baseline logging areas and volumes remain fixed ex-ante.
For each verification period, the WWF will provide the written confirmation from the Forest Department or an independent forest research institution (i.e. entitled to develop a forest management plan) that the AAC is still accurate. If the AAC is outdated, the WWF will develop a new management plan according to the requirements of the VCS methodology.

D.1.1. Sampling design and stratification:

a) Monitoring of baseline emissions

The VCS methodology requires the establishment of of permanent sampling plots (PSPs) following the stratification of the project area. But the inventory of the proposed project was developed by measurements along transects. This approach was applied by the State Forest Inventory Department in accordance with the 'Adoption of the Forest Inventory Instruction'' as stipulated by the Ministry of Natural Resources and Environment of the Russian Federation[33].
Even though stipulated by Russian Forest Regulation, this approach is not in line with the details of the methodology. This does not affect the quality of the proposed baseline, as a) the inventory features a high quality level (i.e. Class II) and b) the AAC, as confirmed by the Forest Department, is independent from the newly conducted inventory. The inventory data specify the key parameters such as tree height, DBH and commercial volume, per tree species for all 13,514 sub-compartments of the project area. The available data exceeds the data demand as stipulated by the VCS methodology.
As the inventory approach is based on transects, not on PSPs, the key parameters such as DBH, tree height and volume are fixed ex-ante. Hence the baseline does not require sampling or stratification.

b) Monitoring of Project Emissions

The monitoring of project emissions may require sampling and stratification, if natural diseases and/or illegal logging occur. The determination of the volume of illegal logging and the determination of f_{ND} requires sampling/stratification. The applied approach is described subsequently:

- Volume of illegal logging: The volume of illegal logging will apply the following stratification
    - All stumps shall be recorded at enumeration list by tree species
    - Diameters of stumps all stumps shall be measured, following by converting to diameter at breast height with use of tables from Far Eastern Forest inventory handbook (1973, Khabarovsk, Russia).

[33] 'Adoption of the Forest Inventory Instruction', 2008, Ministry of Natural Resources and Environment of the Russian Federation, Order No 31, 6th February 2008.

  - Finding trees height as described before
  - Calculating volume.
- Fraction of Forest Naturally Damaged
  - The area where natural disturbances occur will be identified as described in Section D.1. In the disturbed areas, line sample plots (i.e. transects) will be defined. These transects will feature a width of 10m or 20m, which will be specified on site.
    The length of transects will defined in a way ensuring that
    - 50% of burnt areas for small forest fires (5 ha and less),
    - 25% of burnt areas for medium fires (larger than 5 ha up to (incl.) 20ha, and
    - 10% of large burnt area will be covered.

    All damaged trees shall be recorded at special blank. Fallen trees are only recorded in case their stump is allocated inside line sample plot. Average tree height of trees also shall be recorded. Additionally all DBH shall be estimated for each damaged tree.
  - By using volume tables the volume of all damaged trees shall be find out on the line sample plot. By length and width of sample plot its square can be calculated. Total volume of the damage of the stand can be calculated based on ration between total damaged area (recognized before) and line sample plot area.

c) Monitoring of leakage

No sampling or stratification required.

d) Monitoring of Annual Allowable Cut

No sampling or stratification required

D.1.2. Monitoring of the anthropogenic emissions by sources and removals by sinks in the project and baseline scenarios:

D.1.2.1. Data to be collected in order to monitor the changes in carbon stocks in the carbon pools within the project boundary in the project scenario, and how these data will be archived (for each carbon pool and in units of CO_2 equivalent):

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Monitored Data								
1	$A_{ND,j,t}$	*High resolution remote sensing analysis combined with fire fighting control flights by the Forest Department*	*ha*	*m*	*Several times per year*	*100%*	*electronic*	*Area of natural disturbance nd, in stratum j in year t* *Value applied for ex-ante estimate: 17.7 provided in Table 37*
2	$f_{ND,j,t}$	*Collected by a forest inventory team sent to the disturbed areas identified under (1) above*	*dimensionless*	*m*	*Each time, if disturbed areas are detected under (1) above*	*100%*	*electronic*	*Fraction of the forest naturally damaged in stratum j, in year t* *Value applied for ex-ante estimate:0.15 provided in Table 37*

3	$V_{illegal-harvest,t}$	*Collected by a forest inventory team sent to the illegally logged areas if logged areas are identified under (1) above or are identified by WWF's border patrol tours.*	*Cbm*	*M*	*Several times per year*	*100%*	*electronic*	*Volume of wood sold as determined from field surveys in year t* *Value applied for ex-ante estimate: 70*
Data Collected but Not Monitored								
4	$BCEF_j$	*Calculated based on Tier 2 data*	*t.d.m*	*Calculated*	*Once*	*N.A.*	*Electronic*	*Biomass conversion and expansion factor in stratum j* *Value Applied: 0.62* *Value was determined in the excel mode, sheet 'ER Model', cell E189*
5	CF_{AGB}	*Calculated based on Tier 2 data*	*tC*	*Calculated*	*Once*	*N.A.*	*Electronic*	*Carbon fraction in the aboveground*

								biomass of trees for the tropical forest *Values applied: pls refer to Table 16* *Value was determined in the excel mode, sheet 'ER Model', cell E101*
6	$\bar{V}_{gstock,j,t}$	*Determined by the project's inventory for all 13,514 sub-compartments of the prject area*	*Cbm/ha*	*Measured*	*Once*	*N.A.*	*Electronic*	*Average growing stock per hectare for stratum j,* *Value applied: 226.* *Value was determined in the excel mode, sheet 'ER Model', cell E188.*
7	$\bar{G}_{regrowth,ND,j,t}$	*Published re-growth model for Russia Far*	*t.d.m./ha/yr*	*Calculated*	*Once*	*N.A.*	*Electronic*	*Average regrowth per hectare per*

		East						*year of the aboveground biomass after logging in year t* *Value applied: 0.46*

D.1.2.2. Data to be collected in order to monitor the greenhouse gas emissions by sources within the project boundary in the project scenario, and how these data will be archived (for each gas, source, etc.; in units of CO_2 equivalent):								
ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Monitored Data								
All relevant parameters have been tested for their significance. It was concluded that the related emissions are not significant. Hence the related emissions are neglected and no data will be monitored.								
Data Not Monitored and Not Measured								
1	R_{CH4}	IPCC default	Dimensionless	N.A.	Once	100%	Electronic	*Emission ratio for CH4* *Value applied: 0.012*
2	R_{N2O}	IPCC default	Dimensionless	N.A.	Once	100%	Electronic	*Emission ratio for N2O* *Value applied: 0.007*
3	$R_{N/C}$	IPCC default	Dimensionsless	N.A.	Once	100%	Electronic	*Ratio of nitrogen to carbon* *Value applied: 0.01*
4	GWP_{CH4}	IPCC default	tCO_2e/tCH_4	N.A.	Once	100%	Electronic	*Global warming potential of CH4*

								Value applied: 21
5	GWP_{N2O}	IPCC default	tCO_2e/tN_2O	N.A.	Once	100%	Electronic	*Global warming potential of N2O* *Value applied: 276*

D.1.2.3. Description of formulae and/or models used to estimate the changes in carbon stocks in the carbon pools within the project boundary in the project scenario (for each carbon pool and in units of CO_2 equivalent):

Changes in carbon stocks within the project boundary in the project scenario cover emissions due to natural disturbances and the emissions related to illegal logging activities within the project boundary. The annual calculation of the emissions due to natural disturbances follows formula 4-15:

$$C_{AGB-ND,j,t} = \left[\overline{V}_{gstock,j,t=0}\ x\ BCEF_j\ x\ \left(\sum_{ND=1}^{ND} A_{ND,j,t}\right)\right] x\ CF_{AGB} \quad (4\text{-}15)$$

Parameter	Description	Unit
$C_{AGB-ND,j,t}$	Annual carbon in the aboveground biomass of the growing stock in the naturally disturbed area in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\overline{V}_{gstock,j,t=0}$	Average growing stock per hectare for stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	$m^3\ ha^{-1}$
$A_{ND,j,t}$	Annual area of natural disturbance ND, (where ND=1,2,3 ... ND naturally disturbed areas) in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha
$BCEF_j$	Biomass conversion and expansion factor for converting growing stock to carbon in the aboveground biomass for stratum j, (where j=1,2,3 ... J strata)	(t d.m.) m^{-3}

CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest (see Appendix B)	tC (t d.m.)$^{-1}$

In a next step the annual carbon losses of AGB due to natural diseases are determined following formula 4-16:

$$C_{AGB,ND,t} = \sum_{j=1}^{J} (C_{AGB-ND,j,t} \ x \ f_{ND,j,t}) \qquad (4\text{-}16)$$

Parameter	Description	Unit
$C_{AGB,ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{AGB-ND,j,t}$	Annual carbon in the aboveground biomass of the growing stock in the naturally disturbed area in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$f_{ND,j,t}$	Fraction of the growing stock naturally damaged in stratum j (where j = 1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	dimensionless

Formula 4-17a was followed to estimate the re-growth of areas disturbed:

$$C_{regrowth-ND,t} = CF_{AGB} \ x \sum_{j=1}^{J} \left[\sum_{ND=1}^{ND} (A_{ND,j,t}) \ x \ \bar{G}_{regrowth,ND,j,t} \right] \qquad (4\text{-}17a)$$

Parameter	Description	Unit
$C_{regrowth-ND,t}$	Annual carbon increase due to the regrowth in the naturally disturbed area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest (see Appendix B)	tC (t d.m.)$^{-1}$

$A_{ND,j,t}$	Annual area of natural disturbance nd, (where nd=1,2,3 ... ND naturally disturbed areas) in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha
$\bar{G}_{regrowth,ND,j,t}$	Average regrowth per hectare per year in the aboveground biomass after natural disturbance in stratum j, (where j=1,2,3 ... J strata) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	(t d.m.) ha^{-1} yr^{-1}

Formulae 4-18a to 4-20 allow for the quantification of the N_2O- and CH_4 emissions of forest fires. Formula 4-18a outlines the approach for the calculation of CH4 emissions:

$$E_{CH_4,t} = C_{AGB-ND,t} \; x \; R_{CH_4} \; x \; \frac{16}{12} \qquad (4\text{-}18a)$$

Parameter	Description	Unit
$E_{CH_4,t}$	Annual emissions due to CH4 in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCH_4
$C_{AGB-ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
R_{CH_4}	Emission ratio for CH4	dimensionless
$\frac{16}{12}$	The ratio of molecular weight of CH4 to carbon	tCH_4 tC^{-1}

Formula 4-18b was applied to calculate the emissions from N_2O due to forest fires:

$$E_{N_2O,t} = C_{AGB-ND,t} \; x \; R_{\frac{N}{C}} \; x \; R_{N_2O} \; x \; \frac{44}{28} \qquad (4\text{-}18b)$$

Parameter	Description	Unit
$E_{N_2O,t}$	Annual emissions due to N2O in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tN_2O
$C_{AGB-ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project	tC

	Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	
$R_{\frac{N}{C}}$	Ratio of nitrogen to carbon	$tN\ tC^{-1}$
R_{N_2O}	Emission ratio for N2O	dimensionless
$\frac{44}{28}$	The ratio of molecular weight of N2O to N	$tN_2O\ tN^{-1}$

Formula 4-19 allows for converting the N2O- and CH4 emissions into tC:

$$C_{CH_4N_2O,t} = \left(E_{CH_4,t}\ x\ GWP_{CH_4} + E_{N_2O,t}\ x\ GWP_{N_2O}\right) x\ \frac{12}{44} \quad (4\text{-}19)$$

Parameter	Description	Unit
$C_{CH_4N_2O,t}$	Annual carbon from CH4 and N2O emissions in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$E_{CH_4,t}$	Annual emissions due to CH4 in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCH_4
GWP_{CH_4}	Global warming potential of CH4	tCO_2-e $tCH4^{-1}$
$E_{N_2O,t}$	Annual emissions due to N2O in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tN_2O
GWP_{N_2O}	Global warming potential of N2O	tCO_2-e tN_2O^{-1}
$\frac{12}{44}$	The ratio of molecular weight of carbon to carbon carbon dioxide, see Appendix C	tC tCO_2-e^{-1}

Formula 4-20 finally quantifies the total emissions of natural disturbances.

$$C_{natdisturb,t} = \sum_{t=1}^{t}\left(C_{AGB-ND,t} - C_{regrowth-ND,t} + C_{CH_4N_2O,t}\right) \quad (4\text{-}20)$$

Parameter	Description	Unit
$C_{natdisturb,t}$	Annual total carbon losses due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{AGB-ND,t}$	Annual carbon losses in the aboveground biomass of the growing stock due to natural disturbance(s) in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{regrowth-ND,t}$	Annual carbon increase due to the regrowth in the naturally disturbed area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{CH_4N_2O,t}$	Annual carbon from CH4 and N2O emissions in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Finally, the emissions due to illegal logging are calculated based on formula 4-21

$$C_{illegal-harvest,t} = V_{illegal-harvest,t}\ x\ (1 + f_{RSD})\ x\ BEF\ x\ D\ x\ CF_{AGB} \qquad (4\text{-}21)$$

Parameter	Description	Unit
$C_{illegal-harvest,t}$	Annual carbon losses due to illegal harvesting in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$V_{illegal-harvest,t}$	Annual volume of wood sold as determined from field surveys in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	m^3
BEF	Biomass expansion factor for converting volume of extracted roundwood to total aboveground biomass (including bark)	(t d.m.) m^{-3}
D	Wood density for the forest with corresponding climate region and ecological zone	(t d.m.) m^{-3}
CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest	tC (t d.m.)$^{-1}$
f_{RSD}	Factor for residual stand damage, based on the fraction of quantity of carbon damaged in the residual stand to the quantity of carbon in the total merchantable logs harvested	dimensionless

D.1.2.4. Description of formulae and/or models used to estimate the greenhouse gas emissions by sources within the project boundary in the project scenario (for each gas, source, etc.; in units of CO_2 equivalent):

The emissions of project planning- and monitoring have been tested for their significance. It was concluded that these emission sources are insignificant and may be neglected. Hence no models are required.

D.1.2.5. Data necessary for determining the changes in carbon stocks in the carbon pools within the project boundary in the baseline scenario, and how these data will be collected and archived (for each carbon pool and in units of CO_2 equivalent):

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Data Monitored								
The baseline is fixed ex-ante. No monitoring required, not applicable.								
Data Measured Once but not Monitored								
1	$A_{project,t=0}$	*Concession contract, NTFP Mgmt plan and Inventory (the latter for subtraction of specific sub-compartments), provided as GIS data*	*ha*	*Measured*	*Once*	*100%*	*Electronic*	*Project Area at time, t=0* *Value applied: 450,374, pls refer to Table 7*

2	$A_{project,j,t=0}$	*Forest inventory specifying the volume of 13,514 sub-compartments*	*ha*	*Measured*	*Once*	*100%*	*Electronic*	*Project Area within each stratum, j, at time, t=0* *Value applied: 450,374, pls refer to Table 7*
3	$DBH_{n,i,s,j,t=0}$	*Forest inventory*	*cm*	*Measured*	*Once*	*100%*	*Electronic*	*Diameter at breast height t=0 year* *Various values applied* *Pls refer to reference document nr 17 which provides values for each of the 13,514 sub-compartments.*

4	$H_{n,i,s,t=0}$	*Forest inventory*	*m*	*Measured*	*Once*	*100%*	*Electronic*	*Height trees, t=0 year* *Various values applied* *Pls refer to reference document nr 17 which provides values for each of the 13,514 sub-compartments*
5	$A_{NHA_{annual},t}$	*Baseline Mgmt Plan*	*ha*	*Calculated*	*Once*	*100%*	*Electronic*	*Annual net harvest area for the Project Area in year, t* *Values applied: 3,323 and 8,762, pls refer to Table 6*
Data not Measured and not Monitored								

6	*$BCEF_j$*	*Calculated based on Tier 2 BEF and density data*	*t.d.m./cbm*	*Calculated*	*Once*	*100%*	*Electronic*	*Biomass conversion and expansion factor in stratum j* *Value Applied: 0.62* *Value was determined in the excel mode, sheet 'ER Model', cell E189*
7	*BEF*	*FAO, Forest Resource Assessment for Russia*	*dimensionless*	*N.A..*	*N.A.*	*100%*	*Electronic*	*Biomass expansion factor for converting volume of extracted roundwood to total aboveground biomass* *Value applied: 1.40 pls refer to Table 16.*

8	CF_{wood}	*FAO, Forest Resource Assessment for Russia*	*tC/t.d.m*	*N.A..*	*N.A.*	*100%*	*Electronic*	*Carbon fraction of wood for the tropical forest.* *Value applied: 0.50 pls refer to Table 16.*
9	CF_{AGB}	*FAO, Forest Resource Assessment for Russia*	*tC/t.d.m*	*N.A..*	*N.A.*	*100%*	*Electronic*	*Carbon fraction in the aboveground biomass of trees for the tropical forest* *Value applied: 0.50, pls refer to Table 16*
10	D_i	*FAO, Forest Resource Assessment for Russia*	*t.d.m./cdm*	*N.A.*	*N.A.*	*100%*	*Electronic*	*Species-specific density of wood,* *Various values applied, pls refer to table 16*

11	*D*	*Calculated based on FAO FRA and abased on inventory data*	*t.d.m./cdm*	*Calculated*	*Once*	*100%*	*Electronic*	*Wood density for the tropical forest with corresponding climate region and ecological zone* *Value applied: 0.45, pls refer to Table 16.*
12	k_{decay}	*Yatskov et al., 2003*	yr^{-1}	*Calculated*	*N.A.*	*100%*	*Electronic*	*Rate of decay of the deadwood pool* *Value applied: 0.06, pls, refer to Table 18.*
13	f_{RSD}	*Kovalev et al., 2011*	*dimensionless*	*Calculated*	*N.A.*	*100%*	*Electronic*	Factor for residual stand damage *Value applied: 0.41, pls refer to Table 19.*
14	f_{branch_trim}	*FAO, Forest Resource Assessment for Russia*	*dimensionless*	*N.A..*	*N.A.*	*100%*	*Electronic*	*Branch-trim factor* *Value applied: 0.40*

15	$f_{lumber\_recovery}$	Primorskstat, 2010	dimensionless	Calculated	N.A.	100%	Electronic	Lumber recovery factor Value applied 0.45, pls refer to Table 23
16	k_{ltHWP}	IPCC Default	yr^{-1}	N.A.	N.A.	100%	Electronic	Rate of oxidation for long-term harvested wood products Value applied: 0.023
17	k_{stHWP}	IPCC Default	yr^{-1}	N.A.	N.A.	100%	Electronic	Rate of oxidation for short-term harvested wood products Value applied: 1.00

18	$G_{regrowth,t}$	*Calculated based on Dorofeeva, 1974, FAO FRA and Forest Inventory*	*t.d.m./ha/yr*	*Calculated*	*Once*	*100%*	*Electronic*	*Average regrowth per hectare per year of the aboveground biomass after logging in year, t* *Value applied: 0.46, pls refer to Table 26*

D.1.2.6. Data necessary for determining the greenhouse gas emissions by sources within the project boundary in the baseline scenario, and how these data will be collected and archived (for each gas, source, etc.; in units of CO_2 equivalent):								
ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
Data Monitored								
The baseline is fixed ex-ante. No monitoring required, not applicable.								
Data to be Measured Once but not Monitored								
$km_{transport,\ t}$ and $km_{distrib,\ t}$ were not considered as the JI Guidelines do not allow for considering baseline emissions outside of the project boundary.								
Data not Measured and Not Monitored								
1	EF_{fuel}	*IPCC defaults*	tCO_2e/kL	*Calculated*	*Once*	*100%*	*Electronic*	*Fuel emission factor* *Value applied: 0.29519, pls*

								refer to Table 28
2	*$FC_{harvest}$*	*Klvac and Skoupy, 2009*	*kL/m3*	*N.A.*	*N.A.*	*100%*	*Electronic*	*Fuel consumption of equipment employed for felling and snigging per m3 of merchantable log harvested* *Value applied: 0.12*
3	*$FC_{hauling}$*	*Provided by Primorski Gok, a logging company in the region*	*kL/m3*	*Calculated*	*Once*	*100%*	*Electronic*	*Fuel consumption of equipment for hauling one m3 of merchantable log* *Value applied: 1.3*

D.1.2.7. Description of formulae and/or models used to estimate the changes in carbon stocks in the carbon pools within the project boundary in the baseline scenario (for each carbon pool and in units of CO_2 equivalent):

The emissions of forest degradation are determined based on the quantification of emissions due to the decay of deadwood, the emissions from long-term harvested wood products (ltHWP), growth foregone as well as re-growth after logging operations. The detailed approach is presented in below formula 3.2:

$$C'_{degradation,t} = \left[\left(C_{DW_{decay},t} + C_{ltHWP_{oxidation},t} + C_{regrowth,t} \right) x \frac{44}{12} \right] \quad (3.2)$$

Parameter	Description	Unit
$C'_{degradation,t}$	Annual total carbon emissions associated with degradation as a result of the baseline activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C_{DW_{decay},t}$	Annual carbon leaving the deadwood pool due to the decay of deadwood in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{oxidation},t}$	Annual carbon due to the combined delayed oxidation of long-term harvested wood products and immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{growth_{foregone},t}$	Annual carbon lost due to growth foregone in the aboveground biomass in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{regrowth,t}$	Annual carbon increase in the biomass due to regrowth following logging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\frac{44}{12}$	The ratio of molecular weight of carbon dioxide to carbon, see Appendix C	tCO_2-e tC^{-1}

The quantification of average carbon in merchantable logs follows formula 3.3 presented below.

$$\overline{C}_{merch,j,t=0} = D \; x \; CF_{wood} \; x \; \overline{V}_{merch,j,t=0} \quad (3\text{-}3)$$

Parameter	Description	Unit
$\overline{C}_{merch,j,t=0}$	Average carbon per hectare in merchantable logs in stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
D	Wood density for the forest with corresponding climate region and ecological zone	(t d.m.) m^{-3}
CF_{wood}	Carbon fraction of wood for the forest	tC $(t\ d.m.)^{-1}$
$\overline{V}_{merch,j,t=0}$	Average merchantable logs" volume per hectare in stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	m^3 ha^{-1}

Formula 3-4 proposes an approach to determine the average carbon per ha in merchantable logs.

$$\overline{C}_{merch,t=0} = \frac{\sum_{j=1}^{J} \overline{C}_{merch,j,t=0} \, x \, A_{project,j,t=0}}{A_{project,t=0}} \tag{3-4}$$

Parameter	Description	Unit
$\overline{C}_{merch,t=0}$	Average carbon per hectare in merchantable logs in the Project Area determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$\overline{C}_{merch,j,t=0}$	Average carbon per hectare in merchantable logs in stratum j, (where j=1,2,3 ... J strata) determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$A_{project,j,t=0}$	Project Area within each stratum j, (where j=1,2,3 ... J strata) where the IFM-LtPF project activity will be implemented; determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	ha
$A_{project,t=0}$	Project Area where the IFM-LtPF project activity will be implemented; determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	ha

Based on a) the average carbon per ha in stocks which would be removed under the baseline scenario, and based on b) the total annual net harvesting area the total carbon in merchantable logs is calculated following formula 3-15a below:

$$C_{merch,t=0} = \overline{C}_{merch,t=0} \, x \, A_{NHA_{annual},t} \tag{3-15a}$$

Parameter	Description	Unit
$C_{merch,t=0}$	Annual total carbon in the merchantable logs harvested in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\overline{C}_{merch,t=0}$	Average carbon per hectare in the merchantable logs determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

Annual total carbon AGB of the growing stock harvested per year is determined following formula 3-16a below:

$$C_{AGB_{gstock},t} = \bar{C}_{AGB_{gtstock},t=0} \; x \; A_{NHA_{annual},t} \quad (3\text{-}16a)$$

Parameter	Description	Unit
$C_{AGB_{gstock},t}$	Annual total carbon in the aboveground biomass of the growing stock harvested every year in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{C}_{AGB_{gtstock},t=0}$	Average carbon per hectare in the aboveground biomass of the growing stock determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

The volume of tC leaving the deadwood pool per year is calculated following formula 3-17.

$$C_{DW_{decay},t} = f\left(C_{DW_{in},t}, k_{decay}\right) \quad (3\text{-}17)$$

Parameter	Description	Unit
$C_{DW_{decay},t}$	Annual carbon leaving the deadwood pool due to the decay of deadwood in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
k_{decay}	Rate of decay of the deadwood pool	yr

In a next step, the input into the DW pool is specified following formula 3-18 below:

$$C_{DW_{in},t} = C_{RSD_t} + C_{branch_{trim},t} \quad (3\text{-}18)$$

Parameter	Description	Unit
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
C_{RSD_t}	Annual carbon in the residual stand damage in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{branch_{trim},t}$	Annual carbon in branches and trimmings left over from harvesting in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

The annual carbon in the residual stand damage and the annual carbon from trimmings are determined in below functions. The annual carbon in the residual stand damage is specified in formula 3-19.

$$C_{RSD,t} = f_{RSD} \times C_{merch,t} \qquad (3\text{-}19)$$

Parameter	Description	Unit
$C_{RSD,t}$	Annual carbon in the residual stand damage in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
f_{RSD}	Factor for residual stand damage, based on the fraction of quantity of carbon damaged in the residual stand to the quantity of carbon in total merchantable logs harvested	dimensionless
$C_{merch,t}$	Annual total carbon in merchantable logs harvested in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (See Equations 3-15a and 3-15b)	tC

Function 3-20 below outlines the approach for determining the annual carbon input into the DW pool based on trimmings and left over from branches.

$$C_{branch_{trim},t} = f_{branch_{trim}} \times C_{merch,t} \qquad (3\text{-}20)$$

Parameter	Description	Unit
$C_{branch_{trim},t}$	Annual carbon in branches and trimmings left over from harvesting in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

$f_{branch_{trim}}$	Annual total carbon in the merchantable logs harvested in the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{merch,t}$	The fraction of branches and trimmings in the aboveground biomass remaining after trimming of the merchantable logs transferred to the DW pool	dimensionless

Formula 3-21 was followed to determine the decay of deadwood volume in the DW pool over time:

$$F_{DW_{remain},t} = e^{-k_{decay} x\ t} \qquad (3\text{-}21)$$

Parameter	Description	Unit
$F_{DW_{remain},t}$	Annual fraction of carbon in the deadwood pool that would remain in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) after applying the rate of decay	dimensionless
k_{decay}	Rate of decay of the deadwood pool	yr^{-1}
t	1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity	yr

Formula 3-22a was used to calculate the volume of the deadwood pool per year:

$$C_{DW_{pool},t} = \sum_{t=1}^{t*} F_{DW\_remain\_t}\ x\ C_{DW_{in},t} \quad (3\text{-}22a)$$

Parameter	Description	Unit
$C_{DW_{pool},t}$	Cumulative carbon remaining in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$F_{DW_{remain_t}}$	Annual fraction of carbon in the deadwood pool that would remain in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) after applying the rate of decay	dimensionless
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Formula 3-23 allows to calculate the accumulated carbon output of the DW pool:

$$C_{DW_{out},t} = \sum_{t=1}^{t*} C_{DW_{in},t} - C_{DW_{pool},t} \quad (3\text{-}23)$$

Parameter	Description	Unit
$C_{DW_{out},t}$	Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{in},t}$	Annual total carbon input to the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{pool},t}$	Cumulative carbon remaining in the deadwood pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Formula 3-24 finally allows calculating the annual output (i.e. not accumulated) of the DW pool which are considered as baseline emissions:

$$C_{DW_{decay},t} = C_{DW_{out},t} - C_{DW_{out},t-1} \quad (3\text{-}24)$$

Parameter	Description	Unit
$C_{DW_{decay},t}$	Annual carbon leaving the deadwood pool due to the decay of deadwood in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{out},t}$	Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{DW_{out},t-1}$	Cumulative carbon leaving the deadwood pool and emitted into the atmosphere in year t-1, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

The basic approach for the determination of the missions due to the oxidation of ltHWP is laid out in formula 3-25 below:

$$C_{ltHWP_{oxidation},t} = C_{ltHWP_{residues},t} + C_{ltHWP_{net-out},t} \quad (3\text{-}25)$$

Parameter	Description	Unit
$C_{ltHWP_{oxidation},t}$	Annual carbon due to the combined delayed oxidation of long-term harvested wood products and immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{residues},t}$	Annual carbon due to the immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{net-out},t}$	Annual net carbon due to the delayed oxidation of the long-term harvested wood products, leaving the long-term harvested wood products pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

The residues which occur in the course of the processing of ltHWP are calculated based on formula 3-26 below:

$$C_{ltHWP_{residues},t} = \bar{C}_{merch,p,t} \; x \; \left(1 - f_{lumber_{recovery}}\right) x \; A_{NHA_{annual},t} \quad (3\text{-}26)$$

Parameter	Description	Unit
$C_{ltHWP_{residues},t}$	Annual carbon due to the immediate oxidation of long-term harvested wood products residues in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{C}_{merch,p,t}$	Average carbon per hectare in merchantable logs of forest product type p=sawlog, in the Project Area determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC ha^{-1}
$f_{lumber_{recovery}}$	Lumber recovery factor for proportion of merchantable log converted to harvested wood product	dimensionless
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

The input into the ltHWP pool is determined as stipulated by formula 3-27.

$$C_{ltHWP_{in},t} = \bar{C}_{merch,p,t} \; x \; f_{lumber_{recovery}} \; x \; A_{NHA_{annual},t} \qquad (3\text{-}27)$$

Parameter	Description	Unit
$C_{ltHWP_{in},t}$	Annual carbon input to the long-term harvested wood products pool from sawlog in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{C}_{merch,p,t}$	Average carbon per hectare in merchantable logs of forest product type p, in the Project Area determined ex ante - before the start of the IFM-LtPF project activity, hence t=0 year	tC
$f_{lumber_{recovery}}$	Lumber recovery factor for proportion of merchantable log converted to harvested wood product	dimensionless
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	ha

The fraction of carbon which remains in the ltHWP is determined following formula 3-28.

$$F_{ltHWP_{remain}} = e^{-k_{ltHWP_{ox}} x\ t} \qquad (3\text{-}28)$$

Parameter	Description	Unit
$k_{ltHWP_{ox}}$	Rate of oxidation for long-term harvested wood products	yr^{-1}
t	1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity	yr

The volume of the ltHWP is calculated following 3-29a:

$$C_{ltHWP_{pool},t} = \sum_{t}^{t*}\left(F_{ltHWP_{remain},t}\ x\ C_{ltHWP_{in},t}\right) \qquad (3\text{-}29)$$

Parameter	Description	Unit
$C_{ltHWP_{pool},t}$	Cumulative carbon remaining in the ltHWP pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

$F_{ltHWP_{remain},t}$	Annual fraction of ltHWP that would remain in the ltHWP pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) after applying the rate of oxidation	dimensionless
$C_{ltHWP_{in},t}$	Annual carbon input to the long-term harvested wood products pool from sawlog in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Formula 3-30 outlines the approach for quantifying the accumulated amount of carbon which leaves the HWP pool:

$$C_{ltHWP_{out},t} = \sum_{t=1}^{t*} C_{ltHWP_{in},t} - C_{ltHWP_{pool},t} \quad (3\text{-}30)$$

Parameter	Description	Unit
$C_{ltHWP_{out},t}$	Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere from year t=1 to year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{in},t}$	Annual carbon input to the long-term harvested wood products pool from sawlog in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{pool},t}$	Cumulative carbon remaining in the ltHWP pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

Finally, formula 3-31 allows for determining the volume of carbon which leaves the HWP per annum:

$$C_{ltHWP_{net_{out}},t} = C_{ltHWP_{out},t} - C_{ltHWP_{out},t-1} \quad (3\text{-}31)$$

Parameter	Description	Unit
$C_{ltHWP_{net_{out}},t}$	Annual net carbon due to the delayed oxidation of the long-term harvested wood products, leaving the long-term harvested wood products pool in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{ltHWP_{out},t}$	Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

$C_{ltHWP_{out},t-1}$	Cumulative carbon leaving the ltHWP pool and emitted into the atmosphere in year t-1, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC

The carbon stock increase after logging is calculated following formula 3-38:

$$C_{regrowth,t} = \left(\bar{G}_{regrowth,t}\ x\ CF_{AGB}\right) x \sum_{t=1}^{t*} A_{NHA_{annual},t} \qquad (3\text{-}38)$$

Parameter	Description	Unit
$C_{regrowth,t}$	Annual carbon increase in the biomass due to regrowth following logging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$\bar{G}_{regrowth,t}$	Average regrowth per hectare per year of the aboveground biomass after logging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	(t d.m.) ha^{-1} yr^{-1}
CF_{AGB}	Carbon fraction in the aboveground biomass of trees for the forest	tC (t d.m.)$^{-1}$
$A_{NHA_{annual},t}$	Annual net harvest area for the Project Area in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)^^	ha

D.1.2.8. Description of formulae and/or models used to estimate the greenhouse gas emissions by sources within the project boundary in the baseline scenario (for each gas, source, etc.; in units of CO2 equivalent):

Based on above decisions, formula 3-39 outlines the general approach for the quantification of baseline activity emissions:

$$C'_{emissions,t} = E_{harvest,t} + E_{hauling,t} + E_{transport,t} + E_{processing,t} \qquad (3\text{-}39)$$

Parameter	Description	Unit
$C'_{emissions,t}$	Annual total carbon emissions associated with the baseline activity of selective logging operations in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

$E_{harvest,t}$	Annual emissions due to harvesting operations such as felling and snigging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{hauling,t}$	Annual emissions due to log hauling in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{transport,t}$	Annual emissions due to log transport from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$E_{processing,t}$	Annual emissions due to electricity consumption in sawmill in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

In a first step the emissions from harvesting operations are determined following formulae 3-40:

$$E_{harvest,t} = FC_{harvest} \times EF_{fuel} \times V_{merch,t} \quad (3\text{-}40)$$

Parameter	Description	Unit
$E_{harvest,t}$	Annual emissions due to harvesting operations such as felling and snigging in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$FC_{harvest}$	Fuel consumption of equipment employed for felling and snigging per m3 of merchantable log harvested	$kL\ m^{-3}$
EF_{fuel}	Fuel emission factor	tCO_2-e kL^{-1}
$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3

The emissions for hauling are calculated based on formula 3-43:

$$E_{hauling,t} = FC_{hauling} \times EF_{fuel} \times V_{merch,t} \quad (3\text{-}43)$$

Parameter	Description	Unit
$E_{hauling,t}$	Annual emissions due to log hauling in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$FC_{hauling}$	Fuel consumption of equipment for hauling one m3 of merchantable log	$kL\ m^{-3}$

EF_{fuel}	Fuel emission factor	tCO_2-e kL^{-1}
$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3

Formulae 3-44 to 3-46 allow for the quantification of emissions arising from truck transport. Formula 3-44 is used to determine the numbers of truck tours required to transport the merchantable volume to the processing facility:

$$N_{trucks-transport,t} = \frac{V_{merch,t}}{Cap_{truck}} \qquad (3\text{-}44)$$

Parameter	Description	Unit
$N_{trucks-transport,t}$	Number of truck trips required for log transport from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	truck
$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3
Cap_{truck}	Truck load capacity	m^3 $truck^{-1}$

The total transport distance of all trucks employed under the baseline case is determined following formula 3-45:

$$km_{transport-total,t} = km_{transport,t} \ x \ N_{trucks-transport,t} \ x \ \mathbf{2} \qquad (3.45)$$

Parameter	Description	Unit
$km_{transport-total,t}$	Annual total log transport distance in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	km
$km_{transport,t}$	Annual log transport distance from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	km $truck^{-1}$
$km_{transport,t}$	Number of truck trips required for log transport from collection depot to processing plant in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	truck
2	Constant, indicating return trip	dimensionless

Finally the emissions of transportation are determined following formulae 3-46:

$$E_{transport,t} = \frac{km_{transport-total,t}}{Eff_{vehicle}} \ x \ EF_{fuel} \quad (3\text{-}46)$$

Parameter	Description	Unit
$E_{transport,t}$	Annual emissions due to log transport haulage from felling location to the collection depot/ sawmill in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$km_{transport-total}$	Annual total log transport distance in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	km
$Eff_{vehicle}$	Fuel efficiency for vehicle type	km kL^{-1}
EF_{fuel}	Fuel emission factor	tCO_2-e kL^{-1}

Formulae 3-47 and 3-48 are used to determine the emissions of wood processing. Formula 3-47 was followed to calculate the annual electricity consumption of wood processing:

$$Q_{processing,t} = V_{merch,t} \ x \ e_{demand} \quad (3\text{-}47)$$

Parameter	Description	Unit
$Q_{processing,t}$	Annual quantity of electricity consumption for processing in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	kWh
$V_{merch,t}$	Annual volume of merchantable logs in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity) (see Section 3.2.3)	m^3
e_{demand}	Electricity demand for processing per volume processed	kWh m^{-3}

Formula 3-48 finally allows for determining the actual emissions resulting of the electricity consumption of wood processing:

$$E_{processing,t} = Q_{processing,t} \ x \ EF_{electricity} \quad (3\text{-}48)$$

Parameter	Description	Unit
$E_{processing,t}$	Annual emissions due to electricity consumption in sawmill in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$Q_{processing,t}$	Annual quantity of electricity consumption for processing in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	kWh
$EF_{electricity}$	Electricity emission factor for the host country	tCO_2-e kWh^{-1}

D.1.3. Treatment of leakage in the monitoring plan:

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage (for each gas, source, carbon pool, etc.; in units of CO_2 equivalent):

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
A default discount factor of 20% was applied. Please refer to Section E.4 for details. Not Applicable.								

D.1.3.2. Description of formulae and/or models used to estimate leakage (for each gas, source, carbon pool, etc.; in units of CO_2 equivalent):

A default discount factor of 20% was applied. Please refer to Section E.4 for details. Not Applicable.

D.1.4. Description of formulae/and or models used to estimate the enhancements of net anthropogenic removals by sinks by the LULUCF project (for each gas, carbon pool, source, etc.; in units of CO_2 equivalent):

The net anthropogenic removals by sinks by the proposed forest management project is determined following formula 1-1:

$$C'_{IFM-LtPF,t} = C'_{baseline,t} - C'_{actual,t} - C'_{leakage,t} \quad (1\text{-}1)$$

Parameter	Description	Unit
$C'_{IFM-LtPF,t}$	Annual net anthropogenic GHG emission reductions in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C'_{baseline,t}$	Annual total carbon emissions associated with the baseline scenario in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C'_{actual,t}$	Annual total carbon emissions associated with the project activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C'_{leakage,t}$	Annual total carbon emissions associated with leakage in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

The net baseline emissions are determined following formula 3-1:

$$C'_{baseline,t} = C'_{degradation,t} + C'_{emissions,t} \quad (3\text{-}1)$$

Parameter	Description	Unit
$C'_{baseline,t}$	Annual total carbon emissions associated with the baseline scenario in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C'_{degradation,t}$	Annual total carbon emissions associated with degradation as a result of the baseline activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C'_{emissions,t}$	Annual total carbon emissions associated with the baseline activity of selective logging operations in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e

The overall approach for the quantification of project emissions is laid out in formula 4-1:

$$C'_{actual,t} = \left[\left(C_{nat-disturb,t} + C_{illegal_{harvest},t}\right) x\ \frac{44}{12}\right] \quad (4\text{-}1)$$

Parameter	Description	Unit
$C'_{actual,t}$	Annual total carbon emissions associated with the project activity in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tCO_2-e
$C_{nat-disturb,t}$	Annual carbon losses due to natural disturbance(s) in year t, (where t=1,2,3 ... t* years elapsed since the start of the IFM-LtPF project activity)	tC
$C_{illegal_{harvest},t}$	elapsed since the start of the IFM-LtPF project activity)	tC
$\frac{44}{12}$	The ratio of molecular weight of carbon dioxide to carbon, see Appendix C	tCO_2-e tC^{-1}

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the LULUCF project:

There are no (negative) environmental impacts of this forest project, please refer to Section F for a detailed discussion.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
$A_{ND,j,t}$ *No. 1, Table D.1.2.1*	*medium*	*Following QA/QCs will be applied:* ▪ *The reports of the forest fire fighting department shall be crosschecked with reports from the foresty units, which also detect and report forest fires.*
$f_{ND,j,t}$ *No. 2, Table D1.2.1*	*Medium*	*Following QA/QCs will be applied:* ▪ *The analysis will be based on inventory measurements in the disturbed areas. The upper boundary of the 95% confidence interval of biomass lost per tree shall be determined. This value will be used in order to determine f_{ND} in a conservative manner.* ▪ *TCT shall request data on the decrease of volume of the burnt area from forest department (collected by the local forestry unit/lesnichestvo) Forest department (lesnichestvo) report shall identify the compartment, sub-compartments, burnt area and burnt volume of the disturbed area. If the data is inconsistent, the higher burnt volume shall be used for the determination of fND.*

$V_{illegal-harvest,t}$
 	
No. 3, Table D.1.2.1
	Low	*Following QA/QCs will be applied:*
		▪ *The analysis will be based on measurements of all (i.e. 100%) tree stumps. No need for extrapolation and statisticial approaches (e.g. confidence intervals) are needed.*
		▪ *The reports from the anti-poaching brigade will be compared with reports from the Police and the Forestry Unit. If data is inconsistent, the higher data (i.e. volume) shall be applied.*
		▪ *WWF will conduct or order remote sensing analyses in regular intervals in order to cross-check for new infrastructure developments, indicating illegal logging sites.*
		  ▪ *If additional forest infrastructure (not registered by previous raids of anti-poaching brigades) will be determined than the additional field work will be conducted in second phase.*
		  ▪ *The second phase will include verifying detected infrastructure development in the field: WWF together with TCT brigade (or/and contracted forest specialists) will conduct field work for verifying all illegal logging, which were not registered by previous raids or by reports of Forest department and Police. Location, size, volume should be collected and reported.*

D.3. Please describe the operational and management structure that the LULUCF project operator will apply in implementing the monitoring plan:

The proposed forest management project activity will be implemented by the TCT with support from WWF Russia, Amur Branch.

The actual management of project’s climate component will be taken over by WWF Russia, Amur Branch. WWF Russia, Amur Branch engaged a project manager, Mr. Evgeny Lepeshkin, who will be in charge for conducting all related monitoring activities. The project manager has extensive project management capacities and is forester by training. Additionally, the project manager is well familiar with the project site, the local community and TCT’s modalities and procedures. The project manager will be in charge inter alia of sub-sequent activities:

- Evaluation of new forest regulation with respect to changes to the logging volumes and logging areas and eventually requesting confirmations from the Forest Department of Primorsky krai that the rules for timber operations have not changed.
- Managing the monitoring of illegal logging and natural disturbances resulting in a decrease of carbon stocks under the project scenario.
    - Illegal Logging: Determination of volume and tree species of removed trees and the achievements of SOPs, QA/QC I and QA/QCII.
    - Natural Disturbances: Requesting and evaluating the reports of the ‘Forest Fire Fighting Service’ as well as implementation of SOPs and QA/QC procedures.

    - If a disturbed area is detected, the project maanger shall be responsible for engaging inventory teams for the measurements of f_{ND} for each of the affected sub-compartments.
- The project manager will be in charge for aggregating the monitoring information into a JI monitoring report as well as for storing all related documents.

These activities will be managed and administered by WWF's project manager. Eventually WWF will engage qualified institutions/experts to provide detailed information (e.g. inventory team to determine the decrease of forest carbon stocks due to disturbances or illegal logging). Based on this data, annual monitoring reports will be developed and submitted to an AIE for verification.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Mr. Martin Burian,
GFA ENVEST,
Eulenkrugstraße 82,
22359 Hamburg, Germany
martin.burian@gfa-envest.com

Mr. Evgeny Lepeshkin,
WWF Russia, Amur Branch
elepeshkin@amur.wwf.ru

SECTION E. Estimation of enhancements of net anthropogenic removals by sinks

E.1. Estimated project net anthropogenic removals by sinks:

Based on the findings of above section B4, the project net anthropogenic removals by sinks (i.e. negative) are presented in below table. Please note:

- The emissions summarized under $E_{project\text{-}plan,t}$ and $E_{design,\ t}$ have been tested accoding to the CDM A/R tool for testing the significance for GHG emissions. It was concluded that the related emission are insignificant and can be neglected. Consequently, the respective collums are set to zero.
- The determination of emissions due to natural disturbances follows a stepwise approach
  - Step1 – Identification of the total area affected by natural disturbances.
  - Step 2 – Identification of the affected area at a sub-compartment level. The inventory shows biomass data for 13,514 sub-compartments.
  - Step 3 – Determination of f_{ND} based on new biomass measurements.
- The emissions related to illegal logging and related to natural disturbances are accounted for as immediate emissions which is considered to be conservative.

Table 40: Estimated Project Net Anthropogenic Removals by Sinks

$$C'_{actual,t} = E_{proj-plan,t} + E_{design,t} + E_{monitoring,t} + \left[\left(C_{nat-disturb,t} + C_{illegal_{harvest},t}\right) x \frac{44}{12}\right]$$

Year t	$E_{proj-plan,t}$	$E_{monitoring,t}$	$C_{natdisturb,t}$	$C_{illegal-harvest,t}$	$C'_{actual,t}$
1	0	0	192	31	817
2	0	0	192	31	817
3	0	0	192	31	817
4	0	0	192	31	817
5	0	0	192	31	817
6	0	0	192	31	817
7	0	0	192	31	817
8	0	0	192	31	817
9	0	0	192	31	817
10	0	0	192	31	817

E.2. Estimated baseline net anthropogenic removals by sinks:

Based on the findings of above sections, the baseline net anthropogenic removals by sinks (i.e. negative) are presented in below table:

Table 41: Estimated Baseline Net Anthropogenic Removals by Sinks

$$C'_{degradation,t} = \left[(C_{DW_{decay},t} + C_{ltHWP_{oxidation},t} + C_{stHWP_{oxidation},t} + C_{regrowth,t})\ x\ \frac{44}{12}\right] \qquad C'_{baseline,t} = C'_{degradation,t} + C'_{emissions,t}$$

Year t	$C_{DW_{decay},t}$	$C_{ltHWP_{oxidation}}$		$C_{regrowth,t}$	$C'_{degradation,t}$	$C'_{emissions,t}$	$C'_{baseline,t}$
1	1,358	5,302	20,501	1,345	94,657	1,839	96,496
2	5,090	28,371	33,508	4,892	227,614	5,157	232,771
3	8,612	28,875	33,508	8,440	229,367	5,157	234,524
4	11,935	29,367	33,508	11,987	230,350	5,157	235,507
5	15,071	29,848	33,508	15,534	230,607	5,157	235,764
6	18,031	30,318	33,508	19,467	228,764	5,157	233,921
7	20,823	30,778	33,508	24,029	223,959	5,157	229,116
8	23,459	31,227	33,508	28,592	218,538	5,157	223,696
9	25,946	31,666	33,508	33,155	212,537	5,157	217,694
10	28,293	32,094	33,508	37,718	205,985	5,157	211,142

E.3. The difference between E.1. and E.2.:

The difference between E1 and E2 is presented in the table below:

Table 42: Difference between E.1 and E.2

Year t	$C'_{degradation,t}$	$C'_{emissions,t}$	$C'_{actual,t}$	E.1-E.2
1	94,657	1,839	817	95,679
2	227,614	5,157	817	231,954
3	229,367	5,157	817	233,707
4	230,350	5,157	817	234,691
5	230,607	5,157	817	234,947
6	228,764	5,157	817	233,104
7	223,959	5,157	817	228,299
8	218,538	5,157	817	222,879
9	212,537	5,157	817	216,877
10	205,985	5,157	817	210,326

E.4. Estimated leakage:

Following the VCS methodology, leakage shall comprise market leakage and leakage due to activity shifting.

Leakage due to Activity Shifting. The project participant does not hold any other forest concessions. Consequently, there are no opportunities to

- Intensify logging operations in other existing concessions. And to
- Shift logging operations from the project area to any other forest concession within the host country.

Hence, the project does not account for emissions due to activity shifting.

Market leakage. Market leakage refers to the compensation of supply shortfall (due to the conservation of the project area) by other agents in the regional timber market. As the project activity reduces the timber supply, market leakage may occur. The subsequent evaluation of market leakage strictly follows the market leakage tool for Improved Forest Management project activities of the VCS. The tool is specified in the VCS Requirements (Version 3-2), §4.6.15, page 48f.

Market Leakage Region. In order to assess market leakage the analysis was constrained to Primorsky Krai. Comprising a total area of 165,900 km^2, the area of Primorsky Krai is comparable to countries like Tunisia, Suriname and Uruguay. Due to large distances, it is not economically cost efficient to e.g. import timber from other krais/oblasts to Primorsky Krai. Hence the Primorsky Krai is considered as a closed market[34].

Market Leakage Classification. The VCS requirements provide market leakage discount factors (VCS, 2011, Table 3, page 49) for different IFM activities. The proposed project classifies as 'IFM activity that substantially reduces harvest levels permanently with a moderate to high risk for market leakage. For this project type, the VCS tool offers inter alia the following discount factors:

- A discount factor of 0% where leakage occurs outside of the country
- A discount factor of 20%, where the 'ratio of merchantable biomass to total biomass is higher within the project area to which harvesting is displaced'.

If the project area has a high ratio of merchantable biomass to total biomass, it is economically attractive to log the area. If the project area features a high ratio of merchantable to total biomass compared to the market leakage region, then it is economically more attractive to log in the project area, then in the reference region. Consequently, the VCS tool assumes that market leakage will be very limited.

The project area features a high share of HCVF. Logging these forests is economically attractive, as they feature high shares of very highly priced species Ash (4%), Elm (4%), Oak (2%), and of Spruce (26%), Pine (25%), Fir (20%) and Larch (4%). Additionally the forest is old grown forest and not only differs to other regions by a high share of valuable species, but also by high volumes.

Commercial Timber of the Project Area comapared to the Reference Area. The project area takes only 3,8% of total forest area of Primorsky Krai, but it contains 6.2% of the total volume of timber that can be commercially logged. Shares of such valuable timber species as elm (10.6% of the total commercial volume of Primorsky Krai) and ash (7.1%) concentrated at such a small territory potentially makes it forest parcel very attractive for logging companies. Table below shows volumes of mature and over-mature stands, i.e. stands that can be commercially logged in forest area of Primorsky Krai and in Project area.

Table 43: Comparing Commercial Timber Volumes of the Project Area with Primorye

Species	Commercial Timber Volume of Primorsky Krai (in mln m3)	Commercial Timber Volume of the Project area (in mln m3)	Share of Project Area on Primorye's Total Comercial Volume, per Tree Species
Spruce and Fir	388.26	32.09	8.27%
Larch	106.12	2.72	2.56%
Oak	80.71	0.2	0.25%
Ash	23.79	1.69	7.10%

[34] Please note that this holds true, despite being an international hub for timber export. It is assumed that the global timber market prices are not affected due a reduction of timber supply from the market leakage region. The VCS Requirements for AFOLU projects hence stipulate that market leakage outside the country shall not be accounted for.

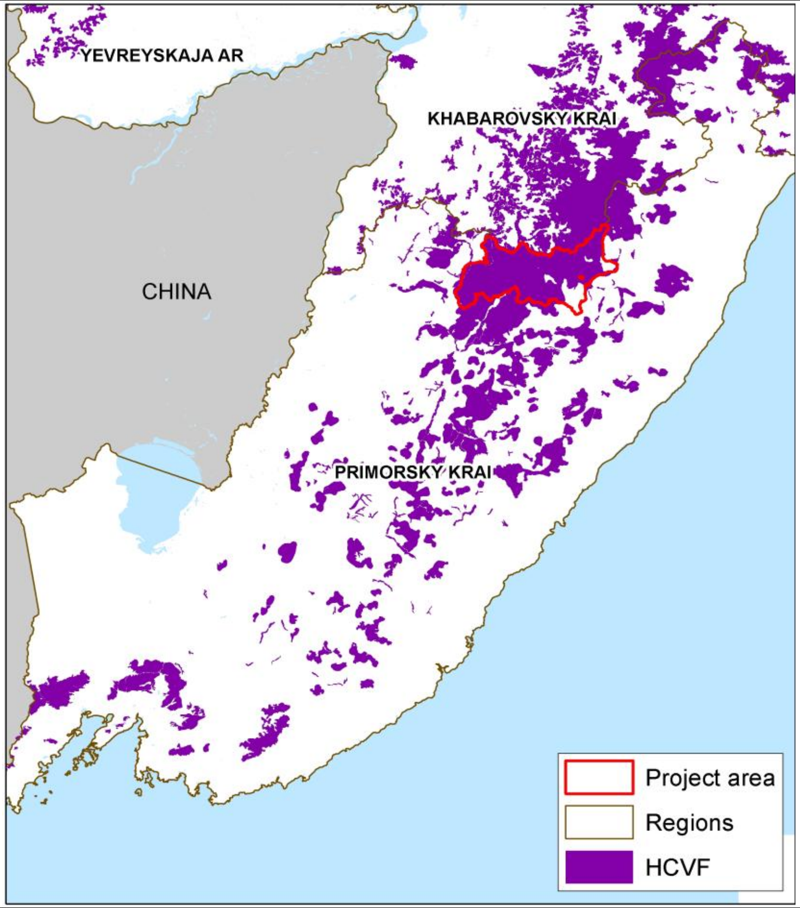
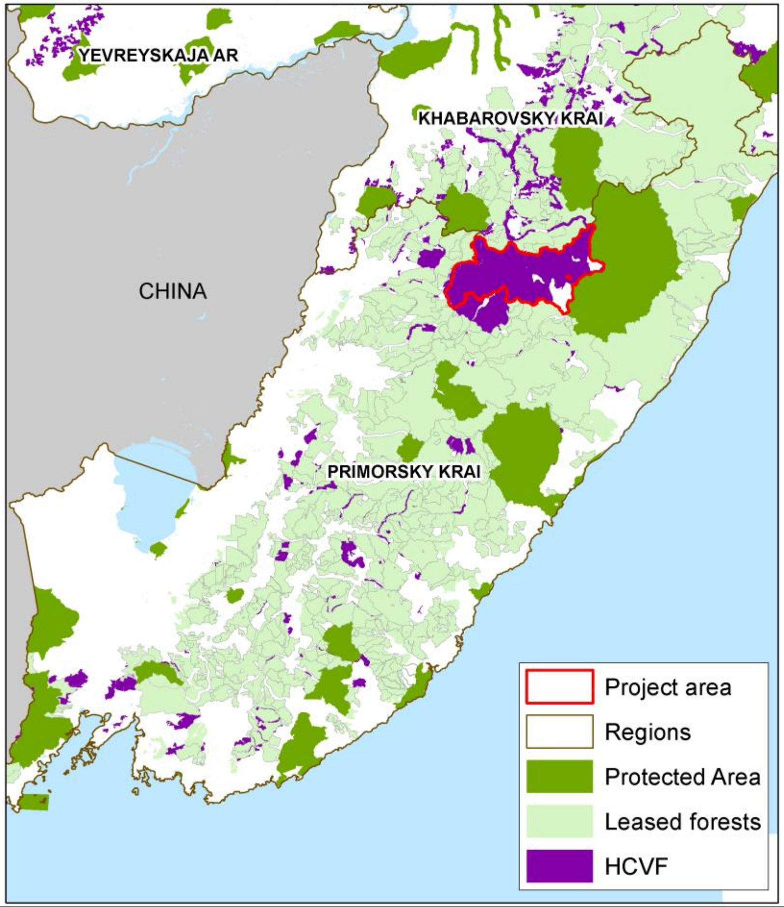
Elm	12.61	1.34	10.63%
Birch	130.34	8.37	6.42%
Aspen	15.2	0.2	1.32%
Total	757.03	46.61	6.16%
Source: Forest plan of Primorsky Krai, 2010th supplements, table 1.1.9, pg 78, NTFP Management plan for Bikin Project area, Table 2.5.1 pgs 9 – 10.			

Forest area of Primorsky Krai amounts to 11,955,300 ha and forest area of the Project area is 450,0374 ha. Comparing average volumes per ha it is possible to see that forests of the project area are very valuable compare to other forest areas of Primorsky Krai. It features about 102.2 m3 of timber which can be logged per hectare. Throughout Primorsky Krai that value is only 63.3 cubic meters per hectare.

Table 44: Comparing Average Volume per Hectare of the Project Area with Primorye

Species	Commercial timber volume per ha Primorsky Krai (in m3/ha)	Commercial timber volume per ha Project area (in m3/ha)	Share (in %)
Spruce and Fir	32.48	70.37	217%
Larch	8.88	5.96	67%
Oak	6.75	0.44	7%
Ash	1.99	3.71	186%
Elm	1.05	2.94	280%
Birch	10.9	18.35	168%
Aspen	1.27	0.44	35%
Total	63.32	102.21	161%
Source: Forest plan of Primorsky Krai, 2010th supplements, table 1.1.9, pg 78, NTFP Management plan for Bikin Project area, Table 2.5.1 pgs 9 – 10.			

Figure 10 below identifies the HCVFs in the market leakage region and in the neighboring krai. Figure 11 demonstrates that all mayor HCVFs are leased as a forest concession or classified as protect areas. The only exemption is the Vostochnaya NHZ which is located directly at the southwest of the project area. This area is protected as a conservation concession with support from WWF Russia, Amur Branch. Hence it is concluded that the ratio of merchantable (and economically attractive) wood to total biomass is high compared to other forest sites in the market leakage region. Consequently there are limited opportunities for market leakage.

Figure 10: Unlogged Mixed Broad-Leaved Forests	Figure 11: Unlogged and Unleased Mixed Broad Leaved Forest
	

Source: Figure developed by WWF Russia, Amur Branch. The figure was developed based on three GIS layers: A) HCVF layer was developed based on WWF Russia's HCFV assessment[35]. B) Leased area layer, developed by WWF Russia, based on the publication of auctions for forest concessions by the Forest Department of Primorye. C) Protected Areas layer based on the publication of the delineation of Protected Areas.

[35] Report avialable at: hwww.globalforestwatch.org/english/russia/pdf/HCVF.pdf

Complementary Analysis of Market Demand and Supply. Additionally to the VCS requirements, a second and complementary analysis was conducted. This analysis shows that the timber market can not compensate the project's supply reduction. This is evidenced by showing that the existing market agents cannot expand their supply, even though timber prices increased.
In 1990ies the timber demands from China sky-rocked. In the subsequent years most of the suitable forest areas were developed and logged. There are no major unlogged forest areas which could be leased as timber concession (which increases the pressure on NHZs). Hence there are limited opportunities for the timber market in Primorsky Krai to compensate the timber shortfall due the logging of new areas and/or the intensification of existing forest concessions. The compensation of supply shortfall is likely to occur in less dense forests. This results in a fairly price-inelastic timber supply function which is demonstrated by below evaluation.

In order to assess market leakage, the market data for Spruce and for Korean Pine were analyzed (other data was not available). Spruce makes up for 25.6% of the total commercial timber volume of the project area, Korean pine covers 23.3%. These two species are by far the most important tree species in the project area.
There is no general price and volume reporting system in Primorsky krai in place, hence data was gathered from the port custom agency in Vladivostok. The port agency keeps track of exported volumes and prices as these are subject to export taxes. Table 45 outlines the timber volumes and prices for spruce and Korean Pine.

Table 45: Korean Pine and Spruce Volume and Price Data

Years	2004	2005	2006	2007	2008	2009
Korean Pine - Average Custom Prices (in Rubel/m3)	2.872	2.943	2.939	2.836	2.776	3.457
Korean Pine - Timber Volumes (in 1000m3)*	106	108	153	147	147	147
Years	2004	2005	2006	2007	2008	2009
Spruce - Average Custom Prices (in Rubel/m3)	1.725	1.856	1.806	2.351	2.374	2.912
Spruce Timber volumes (in 1000m3)	624	656	656	1.149	1.054	649
Source: Data provided by the Vladivostok Port Custom Agency						
Note: *No Korean Pine volumes available for 2008 and 2009. The value of 2007 was applied, even though the development of Spruce would imply a decrease (conservative).						

The data is analyzed in below figures:

Figure 12: Korean Pine Price and Volume Data

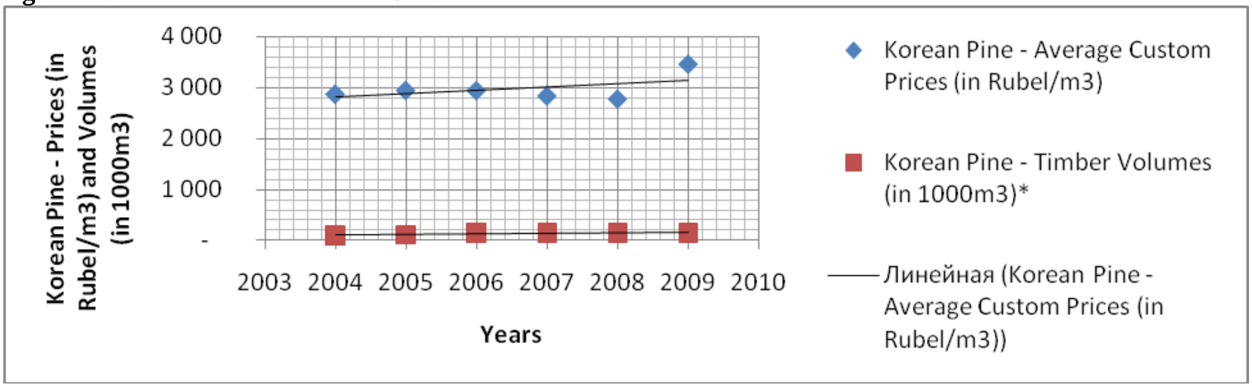
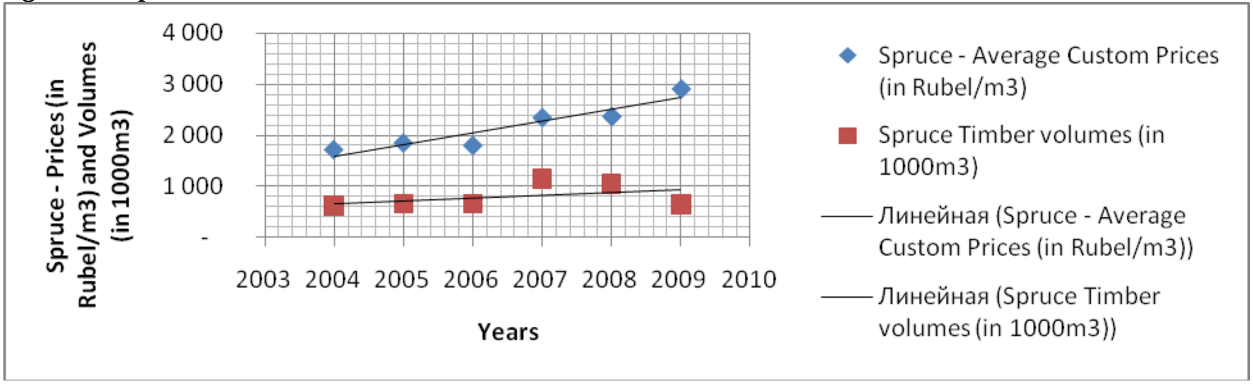


Figure 13: Spruce Price and Volume Data



Both Figure 7 and Figure 8 show a significant increase in prices (blue dots and related trend), whereas the increase of volumes is moderate (red dots and related trend). This shows that the market, even though prices increased significantly, cannot cope with the actual demand (i.e. price inelastic supply). Consequently there are limited opportunities in the market to increase the supply in order to compensate the shortfall of timber production due to the protection of the project area. It is concluded that potential for market leakage in the leakage region is very limited.

Timber Export. The VCS tool allows setting the leakage outside the country to 0. The timber industry of Primorski krai mainly produces timber for export, which is either directly exported to China or is transported to Vladivosok, loaded on ships and then exported to mainly China and Japan. The export ratio of the timber sector in Primorski krai amounts to 85% (RIOTIP, 2008, Forest Sector of Russian Far East an analytical survey, Khabarovsk). It is concluded that the potential for market leakage within the country is limited.

Table 46: Leakage Emissions

Year t	Leakage
1	18,931
2	45,523
3	45,873
4	46,070
5	46,121
6	45,753
7	44,792
8	43,708
9	42,507
10	41,197

Conclusion. Following the VCS methodology and the VCS Requirements§4.6.14 the project shall account for market leakage. The above findings demonstrate:

- The project area features a high commercial volumes per ha compared to the reference region (161%).
- There are no unleased areas which are attractive for logging in the market leakage area.
- The timber export ratio of the market leakage reference region amounts to 85%.
- The economic analysis of the timber market proves that the market cannot substantially increase the supply, even though prices increase.

Based on these findings, are market leakage discount factor of 20% was applied. This leads to the leakage emissions shown in Table 46 which are subsequently subtracted from the project's overall emission reductions.

E.5. The difference between E.3. and E.4 representing the estimated enhancements of net anthropogenic removals by sinks:

The table below presents the net anthropogenic removals by sinks. This comprises the project's increase in forest carbon stocks and leakage, but excludes fossil fuel related emissions of the project- and the baseline case:

Table 47: Estimated Enhancements of Net Anthropogenic Removals by Sinks

Year t	E1-E2	Leakage	Net Anthropogenic Removals by Sinks
1	95,679	18,931	76,748
2	231,954	45,523	186,432
3	233,707	45,873	187,834
4	234,691	46,070	188,621
5	234,947	46,121	188,826
6	233,104	45,753	187,351
7	228,299	44,792	183,507
8	222,879	43,708	179,171
9	216,877	42,507	174,370
10	210,326	41,197	169,129

E.6. Table providing values obtained when applying formulae above:

Finally, the projects overall emission reductions are presented in below table. This comprises the net anthropogenic removals by sinks, leakage, and the fossil fuel related emissions of the project and baseline case:

Net Anthropogenic Removals by Sinks

Year	Estimated Project Net Anthropogenic Removals by Sinks (Tonnes of CO_2 equivalent)	Estimated Baseline Net Anthropogenic Removals by Sinks (Tonnes of CO_2 equivalent)	Estimated Leakage (Tonnes of CO_2 equivalent)	Estimated Enhancements of Net Anthropogenic Removals by Sinks (Tonnes of CO_2 equivalent)
1	817	96,496	18,931	76,748
2	817	232,771	45,523	186,432
3	817	234,524	45,873	187,834
4	817	235,507	46,070	188,621
5	817	235,764	46,121	188,826
6	817	233,921	45,753	187,351
7	817	229,116	44,792	183,507
8	817	223,696	43,708	179,171
9	817	217,694	42,507	174,370
10	817	211,142	41,197	169,129
Total (Tonnes of CO_2 equivalent)	8,166	2,150,630	420,475	1,721,989

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the LULUCF project, including transboundary impacts, in accordance with procedures as determined by the host Party:

The Bikin NHZ is a unique ecosystem being home to at least 12 endangered species (i.e. listed as vulnerable, endangered or critically endangered in the IUCN Red List book, IUCN, 2011[36]). One of these species is the Amur tiger. The tiger population in the Bikin is estimated to 30 to 35 animals. Its primary habitat is rocky Korean Pine – mixed broadleaf forests. Korean Pine stands are also an important ecosystem for the tiger's primary prey (deer and wild boar) through provision of nutrition (such as Korean Pine Nuts, KPN) and shelter functions (Aksenov et al., 2006[37], Simanov, 2008[38]).
The Bikin is not only home to threatened species, it is also home for species which are endemic for the Russian Far East. There are at least 14 endemic species living in the Bikin. Based on the high endemism and based on being habitat to major endangered species, it is concluded that the Bikin is a unique ecosystem on a regional and global scale (Bereznitskiy[39], 2003, Startsev, 2005[40]).
Below table outlines a summary of the project's environmental impacts.

Table 48: Summary of Biodiversity Project Impacts

No	Without Project	With Project	Net Effect
1	Large scale logging operations in the project area would lead to forest degradation and to a decrease of forest dependent species. Unique habitats and nature systems in whole will be lost for the planet.	Only intermediate thinning will be allowed in NHZ, moreover cedar trees will not be cut if not necessary. The diversity of species will stay the same or will even increase.	Positive
2	The main feature of virgin forest will be destroyed – patched forests will be razed to the one-level forest which will not be as stable and resilient as a primary forest and will not be able to feed up the majority of wildlife species.	Patched structure of the forest forms lots of habitat types and livelihood conditions what have a positive effect on breeding and existence of forest- dependent species	Positive
3	Populations of threatened flora and fauna species continue to decline.	Project will leave untouched the areas of threatened species, what will help them to breed and to increase their population.	Positive
4	Road construction will take place all over the NHZ what will cause forest fires, poaching, wildlife disturbance, threatened and common species migration, etc.	Project will forbid any road construction activity.	Positive
5	The livelihood of the native population of Udege people will be disturbed and decreased. Capture will decrease because of increasing activity by alien hunters' (also poaching) and wildlife habitats loss. Fish	Project will leave the territory untouched, forest unlogged, and therefore the native population of Udege people will have their livelihoods sustained.	Positive

[36] IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2

[37] Aksenov, D. E., Dubinin, M. Yu., M. L. Karpachevskiy, M., L., Liksakova, N., S., Skvortsov, V., E., Smirnov, D., Y., Yanitskaya, T., O., 2006, *Mapping High Conservation Value Forests of Primorsky Kray, Russian Far East*, International Social Ecological Union & World Resources Institute, Moscow – Vladivostok, Russia.

[38] Simanov, A.E., Dahmer T.D., 2008, Amur-Heilong River Basin Reader. Ecosystem Ltd., Hong Kong.

[39] Bereznitskiy S., V., 2003, *Ethnical Components of Beliefs and Rituals of Indigenous People of Amur-Sakhalin Region*, Vladivostok, Russia.

[40] Startsev A., F., 2005, *Culture and Way of Life of Udege People*, Vladivostok, Russia.

catch will decrease because of water level decreasing (as a result of forest logging), nut yield will not appear during the next 200 years (because of forest logging).

The above table shows only positive environmental impacts. It is concluded that the JI LULLUCF project will:

- Permanently protect the project area as a natural reserve thereby ensuring the persistence of the old grown ecosystem and avoid strong biodiversity loss,
- Avoid GHG emissions through carbon stock reductions due to clear cutting,
- Serve as a supra-regional lighthouse project for forest conservation;

The project has no negative environmental impacts.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

The project is not expected to have significant environmental impacts. The Federal Law No 232 FZ, Article 11 stipulates, when and Environmental Impact Assessment (so-called ‘environmental expertise’) is required. The project type is not referent to in the context the federal level nor the regional level. It is concluded, that no EIA is required.. Not applicable.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the LULUCF project, as appropriate:

General Note. The project design and its implementation is co-ordinate in close manner between local community, TCT and WWF Russia, Amur Branch.
It shall be noted that the proposed project follows an inherent stakeholder consultation approach. TCT, as representative of the local community, conducts frequent community meetings. During these meetings, all strategic decisions related to the community including the proposed project are discussed. Already in 2008, i.e. prior to project start, the community decided to develop the proposed project activity.

Stakeholder Procedures Required by the Host Party. According to the Federal Law No 232 FZ, no EIA is required. Consequently, the Host Party does not stipulate/require specific stakeholder procedures for the proposed project activity.

Identification of the stakeholders. Krasny Yar is the only village located in the project area. It is the key settlement for all related project activities. Krasny Yar is a rather small settlement featuring about 600 habitats, large part of them are indigenous people of the Udege tribe. Since the village is located in a remote area, it was decided to apply a two-phased stakeholder consultation process.

- One event was conducted in the Pozharsky municipal district capital, Luchegorsk (20th October 2011).
- The second event was conducted at in Krasny Yar, in the project area (21st October 2011)

The above described approach was found most applicable to ensure a broad stakeholder involvement.

Submission of Reports. Prior to the given meetings the project was presented to top regional (Russian Far East) economic, forestry and ecological audiences by the presentation of two reports:

- Darman Yu.A., Smirnov D.Yu., Lepeshkin E.A. Biodiversity conservation and sustainable use of natural resources within Amur tiger habitat // Fifth Far Eastern International Economic Forum. Khabarovsk, 4-5 October, 2011.
- Darman Yu.A., Smirnov D.Yu., Lepeshkin E.A. New international economic mechanism for sustainable forestry in Amur tiger habitats // All-Russia conference "Forest and forestry in current conditions". Far Eastern Forest Research Institute and Far Eastern Department of Rosleshoz, Khabarovsk, 5-6 October, 2011.

The audience included all significant logging companies, key local authorities as well as the general public. Access was free and announcement in regional media has been done in advance. All replies were positive. People highlighted the necessity to conduct sanitary cuts very carefully, conducting only those logging operations that are maximizing conservation of the forest environment.

Stakeholder Meeting in Luchegorsk. Stakeholders consultations in Luchegorsk were widely announced in the local media in advance, access to the hall was open to everyone, at all times. People represented municipal authorities, local Duma (parliament), NGOs (including local Public Chamber), business; political party, the local public and media. The list of key stakeholders is presented below. Additionally, about 10 local citizens and media people, and 5 WWF people took part in the meeting.

In the beginning, there were two presentations (about the Bikin project and about the Kyoto Protocol and JI system), followed by a statement of the project proponent Tribal Commune Tiger. All people were asked for their opinion on the project. There was an active discussion with many questions. Main comments (and all critical comments) are listed and discussed in the below Stakeholder Comments Review Table (Table 45), jointly for both meetings.

Table 49: Stakeholder List - Consultation in Luchegorsk		
	Person / Organization / Company	**Position/ occupation/ sector of activities**
1	Kirpichev V.S.	Chairman of Duma (parliament) of Pozharsky Municipal District
2	Biryukova T.V.	Deputy head of administration of Municipal District Pozharsky
3	Golokha L.V.	Head of the Socio-Economic Development Authority Pozharsky Municipal District
4	Kravchenko T.V.	Chief of Staff of Pozharsky Municipal District Duma
5	Ilyina G.G.	Deputy Chairman of the Public Chamber of Municipal District Pozharsky
6	Borik N.A	Acting Local Secretary of the Political Council of the local branch Pozharsky "United Russia" political party
7	Galkin A.N.	Head of Verkhne-Perevalnensky branch of Provincial Department “Primorskoye forestry”
8	Shirko V.A.	President of the Regional public organization Association of indigenous peoples of the North of Primorsky Krai, Chairman of the indigenous peoples enterprise “Tiger” of Krasny Yar village, deputy of Duma of Pozharsky municipal district
9	Uza A.L.	Head of Krasny Yar village
10	Kuchenko I.A.	Deputy Chairman of the indigenous peoples enterprise “Tiger” of Krasny Yar village
11	Tsvetkova M.F.	Head of NGO “Pervotsvet”, Luchegorsk village
12	Zamolodchikov D.G.	Working group of Russia on Kyoto Process, Center of Ecology and Forests Productivity of Russian Academy of Sciences (Moscow)

Stakeholder Meeting in Krasny Yar. The Stakeholder consultation in Krasny Yar was widely announced in the village in advance, access to the room was open. People represented village authorities, local Duma, local teachers, and local businesses. The list of key stakeholders is presented below. Additionally, about 5 local citizens, and 4 WWF people took part in the meeting. In the beginning, there were two presentations (about the Bikin project and about social development of the village) followed by an active discussion with many question. Main comments (and all critical comments) are listed below in the Stakeholder Comments Review Table (Table 45) for both consultations together.

Table 50: Stakeholder List - Consultations in Krasny Yar		
	Person/Organization/Company	**Position/ occupation/ sector of activities**
1	Uza A.L.	Head of Krasny Yar village
2	Shirko V.A.	President of the Regional public organization Association of indigenous peoples of the North of Primorsky Krai, Chairman of the indigenous peoples enterprise “Tiger” of Krasny Yar village, deputy of Duma of Pozharsky municipal district
3	Kanchuga G. L.	Member of Duma; School principle
4	Pionka N. N.	Member of Duma; Teacher
5	Ushakova G. N.	Member of Duma; Medical assistant
6	Adyan V. I.	Member of Duma; Hunter of Indigenous peoples enterprise “Tiger”
7	Kuchenko I. A.	Deputy Chairman of the indigenous peoples enterprise “Tiger” of Krasny Yar village
8	Sulyandziga A. V.	Member of Duma; Private entrepreneur
9	Kanchuga G. M.	Member of Duma; Medical assistant
10	Gorunov N. I.	Head of operative brigade of Indigenous peoples enterprise “Tiger”

11	Smirnova S. V.	Member of Duma; Head on non-timber forest products of Indigenous peoples enterprise "Tiger"

Comments Received. People asked to clarify the details of the JI system and the principles of additionality, the role of the Tribal Commune Tiger, and of authorities in Moscow and German organisations. They expressed a positive view on the project as a whole, highlighting the importance of long-term conservation of forests for traditional forest-use without clear cuttings.

Main critical attention was paid to the spending/use of carbon revenues. People critically discussed different options and decided to recommend the following:

- Covering the concession fee for the NHZ and the riparian zone;
- Financing activities against illegal timber harvesting and nature use;
- Financing forest fire protection measures in the project area;
- Supporting infrastructure development for processing non-timber forest products and for support of traditional livelihood of indigenous peoples; and
- Financing social development measures in Krasny Yar village.

The first three items are quite clear for local stakeholders. In infrastructure development, people recommended to the Head of Verkhne-Perevalnensky branch of Provincial Department "Primorskoye forestry" to work out a range of proposals for organizing a fire preventing system for the protection of the middle and upper reaches of the Bikin forest.

After a lengthy discussion, it was decided to compile:

- A social development plan, and
- A development program for the Territory of Traditional Nature Use (TTNU) of the project area

The social development plan should be compiled as soon as possible. The Chairman of the indigenous people enterprise "Tiger" of Krasny Yar village and Head of Krasny Yar village should elaborate the development program for the TTNU and social development of the village.

For making the allocation of funds transparent and considering interests of all parties involved, Adyan V.I. suggested to establish a Supervisory Board including representatives of the indigenous peoples enterprise Tribal Commune Tiger , the Administration, the Duma of Pozharsky municipal district, the Verkhne-Perevalnensky branch of the Provincial Department "Primorskoye forestry", the Forestry Department of Primorsky Krai, the administration of Krasny Yar settlement and NGOs, including local Public Chamber and WWF. People approved the proposal without any objection.

Table 51: Stakeholder Comment Review

	Subject to comments	Stakeholder position
1	**Options to use expected cabon revenues**	Immediately discuss and develop a list of priorities, properly reflect this list in an Investment Declaration to be presented to a Russian top JI authority. Priorities are the following: long term lease of Korean pine nut-harvesting zone; halting illegal timber harvesting and nature use; preventing forest fires in the Bikin River basin; support infrastructure development for processing non-timber forest products and for support of traditional livelihood of indigenous peoples; and social development of Krasny Yar village. Head of Verkhne-Perevalnensky branch of Provincial Department "Primorskoye forestry" should work out a range of proposals for organizing a fire preventing system for the protection of the middle and upper reaches of the Bikin forest.
2	**Use funds for social development of Krasny Yar village**	This was discussed as the last of the options listed above. Priority of the given item is not clear yet. A plan for the social development of the village (responsible person – Head of local administration) will be

		developed, presented and agreed with the local Duma. The chairman of the indigenous people enterprise “Tribal Commune Tiger” of Krasny Yar village and the Head of Krasny Yar village should elaborate the development program for the Territory of Traditional Nature Use and the plan for social development of the village. Both plans shall be accomplished in advance to receiving carbon revenues
3	**Access to the information on the project implementation**	Information on forest management and practices (activities) of the project is available, but it should be provided on a regular basis. All information about subsequent steps of the project should be published in the local newspaper “Krasny Yar Vestnik”.
4	**Package of complicate documents is not ready**	WWF should complete the PDD and all documents required for presentation to official JI bodies of RF and Germany according to current JI regulation. These documents shall be promoted in the governmental structures of the Russian Federation and Germany.
5	**Acknowledgement of a public opinion**	Establish a Supervisory Board including representatives of the indigenous people enterprise “Tiger”, the Administration, the Duma of Pozharsky municipal district, Verkhne-Perevalnensky branch of Provincial Department “Primorskoye forestry”, Forestry Department of Primorsky Krai, Administration of Krasny Yar settlement and NGOs, including the local Public Chamber and WWF. People approved the proposal without any objection.
6	**Environmental impacts:** ▪ Biodiversity conservation ▪ Water resources ▪ Soil resources ▪ Air protection ▪ Noise ▪ Forest protection	No negative environmental impacts were mentioned. All respondents highlighted positive impacts for all listed aspects.
5	**Social impact:** ▪ Rights and economic interest of local population ▪ Public involvement	According to the received feedback, the interests of the local population are certainly considered within the project design. The impact on the economic interest of the local population is certainly positive. The overall opinion confirmed a broad interest and involvement of local stakeholders into the proposed project.

Conclusion. It may be concluded that stakeholders have a positive perception of the JI project: No negative comments were received.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	**Tribal Commune Tiger**
Street/P.O.Box:	1-5 Novaya Street, Pozharsky District
Building:	
City:	
State/Region:	Primorsky Krai
Postal code:	692017
Country:	Russian Federation
Phone:	
Fax:	
E-mail:	
URL:	
Represented by:	Vladimir A. Shirko
Title:	Mr.
Salutation:	Chairman of the Commune
Last name:	Shirko
Middle name:	A.
First name:	Vladimir
Department:	
Phone (direct):	+7 42357 38623
Fax (direct):	
Mobile:	
Personal e-mail:	vladimir-shirko@yandex.ru

Organisation:	**CF Partners (UK) LLP**
Street/P.O.Box:	149 Hammersmith Road
Building:	
City:	London
State/Region:	
Postal code:	W14 0QL
Country:	United Kingdom
Phone:	+44 207348 3500
Fax:	+44 207348 3505
E-mail:	n.mueller@cf-partners.com
URL:	www.cf-partners.com
Represented by:	Nadine Mueller
Title:	Director
Salutation:	Ms.
Last name:	Mueller
Middle name:	
First name:	Nadine
Department:	
Phone (direct):	+44 207 348 3514
Fax (direct):	+44 207 348 3505
Mobile:	+44 78 42967429
Personal e-mail:	nad.mueller@gmail.com

Annex 2

BASELINE INFORMATION

Annex 2.1: Calculation of the Annual Allowable Cut
Please refer to documents provided separately (scan of original with authorized translation)

Annex 2.2: Nut Harvesting Zones in Primorski Krai and Khabarovsk Krais

Table 52: NHZs in Primorski and Khabarovsk Krais				
1. NHZ of Khabarovsk Krai				
№	NHZ Name Russian	NHZ Name English	Lesnichestvo	Area (in ha)
1	Бикинская	Bikinskiy	Bikinskoe, Lermontovskoe	28.481
2	Нанайская	Nanayskiy	Gassinskoe	55.522
3	Болоньская	Bolonskiy	Selgonskoe	18.746
4	Аванская	Avanskiy	Kapitonovskoe, Podkhorenovskoe	19.382
5	Гурская	Gurskiy	Pivan'skoe, Selihinskoe, Snezhnoe, Dappinskoe	52.568
6	Мухенская	Mukhenskiy	Sijskoe	14.040
7	Сукпайская	Sukpajskiy	Gornoe	18.742
8	Кур-Урмийская	Kur-Urmijskiy	Inskoe	6.719
9	Уликанская	Ulikanskiy	Niranskoe, Birakanskoe	46.346
10	Комсомольская	Komsomolskiy	Gorunskoe	2.922
11	Оборская	Oborskiy	Sitinskoe, Verkhne-Neptinskoe	5.281
		Sum		268.749
2. NHZ of Primorsky Krai				
№	NHZ Name Russian	NHZ Name English	Lesnichestvo	Area (in ha)
12	Бикинская	Bikinskaya incl. riparian zone	Verkhne-Perevalnenskoe	461.154
13	Пожарская	Pozharskaya	Verkhne-Perevalnenskoe	41.192
14	Восточная	Vostochnaya	Roschinskoe	95.303
15	Мельничная	Melnichnaya	Roschinskoe	22.117
16	Кокшарская	Koksharskaya	Chuguevskoe	27.755
17	Ольгинская	Olginskaya	Kavalerovskoe	40.706
			Sum	688.227
			Total 1+ 2 (in ha)	956.976

Annex 2.3: Confirmation of the FFRI calculation
Please refer to documents provided separately (scan of original with authorized translation)

Annex 2.4: Data on Removed Compartment and Sub-Compartments Due to Logging

Table 53: Sub-Compartments with Legal Logging

Compartment (Nr)	Sub-Compartment (Nr)	Area (in ha)	Commercial Volume (in m3/ha)	Logging Intensity (in %)	Volume (in m3)
120	12	45	220	20	9,900
120	14	149	220	20	32,780
120	19	65	220	20	14,300
120	22	1.1	250	20	275
121	12	24	220	20	5,280
121	17	24	230	20	5,520
121	22	36	190	20	6,840
121	26	9.6	220	20	2,112
121	30	19	230	20	4,370
122	11	19	230	20	4,370
124	4	20	220	20	4,400
124	6	17	230	20	3,910
124	15	15	220	20	3,300
124	18	14	270	30	3,780
124	27	41	200	30	8,200
126	7	18	210	20	3,780
126	19	91	220	20	20,020
126	22	8.9	220	20	1,958
126	27	11	220	20	2,420
126	28	24	220	20	5,280
126	32	6.8	250	20	1,700
126	36	8.1	200	20	1,620
126	38	16	180	20	2,880
126	43	20	210	20	4,200
126	44	38	250	30	9,500
126	48	41	220	20	9,020
126	50	33	190	30	6,270
126	53	22	220	20	4,840
126	55	4.5	230	20	1,035
126	58	4.3	230	20	989
126	61	8.8	250	30	2,200
127	6	36	240	20	8,640
128	15	39	240	20	9,360
128	20	17	240	20	4,080
128	22	33	230	20	7,590
128	24	7.4	230	20	1,702
128	28	25	230	20	5,750
128	29	29	230	20	6,670
128	32	26	230	20	5,980
128	34	8.7	220	20	1,914
128	37	59	270	30	15,930
129	19	57	230	20	13,110
129	27	50	230	20	11,500
131	10	78	230	20	17,940
131	18	55	260	35	14,300

131	20	31	230	20	7,130
131	25	54	220	20	11,880
132	14	31	250	20	7,750
132	16	24	230	20	5,520
132	18	29	270	30	7,830
133	17	68	260	30	17,680
134	9	35	250	20	8,750
134	14	27	270	30	7,290
134	21	40	270	30	10,800
136	9	51	280	20	14,280
136	15	23	270	30	6,210
136	17	129	340	35	43,860
136	18	80	290	30	23,200
136	26	52	280	20	14,560
138	7	34	230	20	7,820
138	18	29	230	20	6,670
138	22	6.3	220	20	1,386
138	30	22	220	20	4,840
139	13	38	280	20	10,640
139	18	8.5	170	20	1,445
139	27	19	180	20	3,420
139	29	35	220	20	7,700
139	32	4.6	250	20	1,150
140	7	74	220	20	16,280
140	13	5.6	170	20	952
140	20	39	230	20	8,970
140	21	18	180	20	3,240
140	29	75	220	20	16,500
141	17	8.7	220	20	1,914
141	20	21	270	35	5,670
141	23	17	180	20	3,060
141	24	21	230	20	4,830
141	25	52	300	35	15,600
142	1	32	230	20	7,360
143	2	56	220	20	12,320
144	8	10	250	20	2,500
144	24	63	250	20	15,750
144	30	22	250	20	5,500
144	34	31	220	20	6,820
144	35	27	230	20	6,210
145	19	47	240	20	11,280
146	4	74	230	20	17,020
146	7	36	220	20	7,920
146	18	18	230	20	4,140
146	20	26	260	20	6,760
147	5	20	260	30	5,200
147	11	13	260	20	3,380
147	22	155	330	30	51,150
148	3	67	250	20	16,750
148	4	13	270	30	3,510
148	5	115	330	30	37,950

148	7	92	270	20	24,840
148	10	28	270	20	7,560
148	13	178	260	20	46,280
148	17	8.9	270	30	2,403
149	10	13	300	30	3,900
149	12	26	320	30	8,320
149	14	131	260	20	34,060
149	17	71	320	30	22,720
150	8	19	290	30	5,510
150	11	124	270	20	33,480
150	15	56	330	30	18,480
150	18	93	230	20	21,390
150	19	37	270	20	9,990
151	14	58	150	20	8,700
151	31	29	220	20	6,380
153	10	39	190	20	7,410
153	15	45	200	20	9,000
153	16	23	190	20	4,370
153	18	9.5	190	20	1,805
154	11	40	190	20	7,600
154	22	16	190	20	3,040
154	25	58	250	30	14,500
155	23	46	250	30	11,500
155	26	37	190	20	7,030
157	8	15	220	20	3,300
157	19	75	230	20	17,250
158	22	34	230	20	7,820
158	39	5.2	230	20	1,196
159	8	35	220	20	7,700
159	21	49	220	20	10,780
159	23	48	220	20	10,560
160	29	56	220	20	12,320
160	31	68	200	20	13,600
160	34	15	220	20	3,300
160	35	40	240	20	9,600
160	40	56	240	20	13,440
160	41	63	230	20	14,490
160	42	16	230	20	3,680
Totals	**134**	**5,254**			**1,291,166**
Source: NTFP Management Plan for TCT, Annex 3, Table 5.3.3, Page 70ff.					

Annex 2.5: Determination of the AAC for Selective Commercial Logging

Table 54: Determination of the AAC for Selective Commercial Logging

Foresty Unit	AAC for Selective Commercial Logging	Source
Chuguevskiy	330,600	pg. 43 table 2.1.1.2, forestry regulative document of Chuguevskiy management unit, 2009, Vladivostok
Usuriskiy	32,400	pg. 39 table 2.1.1.3, forestry regulative document of Ussuriskiy management unit, 2009, Vladivostok
Terneiskiy	973,600	pg. 39 table 2.1.1.2, forestry regulative document of Terneiskiy management unit, 2009, Vladivostok
Spasskiy	27,000	pg. 36 table 2.1.1.1, forestry regulative document of Spasskiy management unit, 2009, Vladivostok
Sergeevskiy	104,900	pg. 49 table 2.1.1.1, forestry regulative document of Sergeevskiy management unit, 2009, Vladivostok
Roshinskiy	697,800	pg. 38 table 2.1.1.2, forestry regulative document of Kavalerovskiy management unit, 2009, Vladivostok
Kavalerovskiy	423,000	pg. 41 table 2.1.1.2, forestry regulative document of Kavalerovskiy management unit, 2009, Vladivostok
Dal'nerechenskiy	163,400	pg. 72 table 2.1.1.1, forestry regulative document of Dal'nerechenskiy management unit, 2009, Vladivostok
Vladivostokskiy	20,800	pg. 68 table 2.1.1.1, forestry regulative document of Vladivostokskiy management unit, 2009, Vladivostok
Verkhne-Pereval'ninskiy	177,800	pg. 47 table 8, forestry regulative document of Verkhne-Pereval'ninskiy management unit, 2009, Vladivostok
Arsenevskiy	71,500	pg. 36 table 2.1.1.1 forestry regulative document of Arsenevskiy management unit, 2009, Vladivostok
Sum	3,022,800	Calculated

Annex 3

MONITORING PLAN

Please refer to Section D.