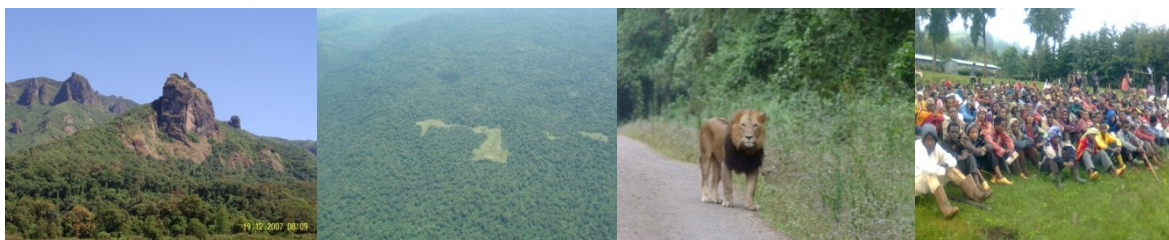


Bale Mountains Eco-region Reduction of Emission from Deforestation and Forest Degradation (REDD+) Project



Document Prepared by

Project proponent
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Partners of the project
Farm Africa & SOS Sahel Ethiopia

END HUNGER >>> GROW FARMING
FARM AFRICA

SOS SAHEL
ETHIOPIA

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PROJECT SUMMARY INFORMATION

- i. **Project Name :** Bale Mountains Eco-region REDD+ Project
- ii. **Project Location:** Ethiopia, Bale Mountains Eco-Region
- iii. **Project Proponent:** Oromia Regional State of Ethiopia Federal Democratic Republic, through Oromia Forest and wildlife Enterprise represented by Didha Diriba (Director General)
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- v. **Project Start Date:** January 01, 2012 and GHG accounting period and project lifetime: 20 years from project start date.
- vi. **Validation:** PDD submitted for full validation of Climate, Community & Biodiversity Standards and Verified Carbon Standard
- vii. **History of CCBS status:** “Bale Mountains Eco-region REDD+ project PDD was primary posted on CCBA web page on May 27th, 2014 (<http://www.climate-standards.org/2014/05/27/bale-mountains-eco-region-redd-project/>). Based on feedbacks obtained through auditing process and respective delays, the PDD (version 3.4) was updated to CCB-Standard 3rd Edition and published for public stakeholder consultation for the second time on the CCBA website from 10 February 2016 – 10 March 2016. Minor adaptations concerning the clear numbering of the indicators of the Standard 3rd edition were conducted as required by the CCBA secretariat and updated to PDD version 3.5). However, the registration for validation was holdon to have the combined registration and issuance on VCUs for validation and verification. This PDD **version 3.5** is submitted to CCBA only for the registration purpose without seeking further comments.
- viii. **CCBS edition:** Third edition
- ix. **Project's Climate, Community and Biodiversity benefits**
Community benefits: The project will engage the local communities (men, women and youth) living in and around the forest in the design and implementation of the REDD+ project. This engagement formalizes communities' use right and access to sustainable use of forest products, commercial as well as subsistence uses. Community will harvest fuelwood, construction materials and other subsistence products according to the participatory forest management plan developed plus commercial production of non-timber forest products such as honey and wild coffee. As a result of

the project, the community also benefits from various trainings and capacity building supports; material and technical support for improved quality and quantity production of forest products and market linkage facilitation through the project proponent. These supports will enhance communities' forest based income and overall food security.

The communities will also financially benefit from the project through sharing of carbon revenue. Benefit sharing arrangement has been negotiated between project proponent and community and a consensus was reached. According to the agreement community will receive 60% of carbon revenue and the government 40%. Moreover, community will benefit exclusively from sustainable collection and marketing of non-timber forest products.

The local community will also greatly benefit from REDD-plus and governance reform processes that are in line with, and contribute to national poverty-reduction strategies through developing sustainable livelihoods that recognize the potential for community based options for sustainable management of forests. It can also benefit from the REDD+ activities designed to offset the on-going deforestation and forest degradation in the area. The community will benefit from equitable distribution from emissions reductions payments. It can also provide some job opportunities. In addition to this, better watershed management practices through improved forest management can have a positive impact on productivity of surrounding agricultural fields. The community can benefit from provision of improved agricultural extension services, better education and health.

Biodiversity benefits: The Bale Mountains are unique in Africa and encompass Africa's largest alpine plateau which contains the largest populations of two of Africa's least known and yet most charismatic species – the Ethiopian wolf and the Mountain Nyala. Bale Mountains also harbour an exceptionally high number of other species endemic to Ethiopia and, in some cases, endemic to the Bale Mountains themselves. They are included in Conservation International's Eastern Afrotropical Biodiversity Hotspot (one of 34 such critical eco-regions for biodiversity conservation in the world) and are designated as one of BirdLife International's Important Bird Areas.

Among the larger mammal species of the area, five deserve special conservation attention since they are not only endemic and/or globally threatened, but are also important flagship species for the Ethiopian highlands. These include the endangered endemic Bale monkey (*Chlorocebus djamdjamensis*), Ethiopian wolf (*Canis simensis*) and Mountain nyala (*Tragelaphus buxtoni*), as well as the endangered Wild dog (*Lycaon pictus*) and the Ethiopian lion (*Panthera leo*) which has recently been recognized as genetically different from other lion in East Africa.

Around 78 species of mammals are recorded in Bale, which represent 40% of mammals known from the whole Ethiopia. Out of these, 20 species are Ethiopian endemics, representing 26% of the total species reported in the area. This is by far the highest proportion of endemics. On average, about 10% of the flora and fauna of Ethiopia are endemic. The endemic mammals of the Bale Mountains also 67% of the total endemic mammals recorded in the Ethiopian highlands. Isolation and rarity put these endemic species at high risk of extinction and, thus, in need of effective conservation strategies that are supported nationally and internationally. Not only does this area protect a significant portion of Ethiopia's and the world's biodiversity, it is also an area with immense benefits for species evolutionary processes.

However, the current trend of ecological degradation in the area poses a severe threat to the survival of most of these rare species. It has even been said that "if conservation efforts are not successful and people continue to exploit the resources in an unsustainable way, more species of mammals would go extinct than any area of equivalent size on the globe."

Hence the work that is envisaged to be carried out by the REDD+ project over the whole Bale Mountains area will no doubt have an exceptional biodiversity benefits while placing a sustainable natural resources management system in an area with such global significance.

There are seven globally threatened species of birds recorded in the Bale Mountains. These include four vulnerable species (Greater Spotted Eagle, Imperial Eagle, Lesser Kestrel and Wattled Crane), and three near-threatened species (Pallid Harrier, Rouget's Rail, and Abyssinian Longclaw). The 6 endemics out of the total 16 Ethiopian endemics are: Spot-breasted Plover, Yellow-fronted Parrot, Abyssinian Longclaw, Abyssinian Catbird and Black-headed Siskin. The Spot-breasted Plover

population is the largest and most significant for the species, and hence deserves conservation on its own. Therefore, the project will contribute to sustainable conservation of all the fauna and floras existing in the project zone through community participation.

Climate benefits: Under the business as usual scenario the Bale Eco-region will result in the deforestation of 84,150 ha of tropical forest and GHG emission of 38,321,332.28 tCO₂e. The project aims to prevent this high rate of deforestation and subsequent emission of GHGs, and to achieve a net anthropogenic GHG emission reduction, which is ex-ante estimated to be 25,776,421.40tCO₂e. With the buffer for risk of 15%, equivalent of buffer credit of 3866463.21 tCO₂e estimated for the project, the net ex-ante anthropogenic GHG emission reduction under the project scenario will be 21909958.19 tCO₂e.

x. Optional Goldlevel criteria

Climate change adaption benefits (GI).

As a result of deforestation, climate change affects the livelihood of local communities. For instance lower river flows during dry season which affects downstream community and hydropower generation. Increased drought and incidences of forest fires. To mitigate these challenges, a project has intended to improve better management of an ecosystems/habitats, biodiversity and the delivery of environmental services of the forest areas in relation to addressing key attributes that are indicated under (GL). Similarly, the project will support the climate adaptive measures like fuel efficient stoves and woodlot planation

Exceptional community benefits (GL2)

The important attributes of exceptional community benefits will be addressed in respect of (GL2) of CCBA stand third edition. Accordingly, the project has planned to ensure communities forest use right, improving the wellbeing of local community at individual as well as at group level. The project works strongly to bring positive action on women to participate in implementing project activities and decision making process. similarly, strengthen REDD+ CBOs organization capacity will be carried out to enable full and effective participation of community members in project decision making and implementation. The project also works in avoiding any risks/ trade off to not happen on local community. Besides of all these, the project targets to design appropriate carbon benefit sharing mechanism through participation of local community.

Exceptional biodiversity benefits (GL3)

Bale Mountains harbour an exceptionally high number of species endemic to Ethiopia and, in some cases, endemic to the Bale Mountains themselves. Around 78 species of mammals are recorded in Bale, which represent 40% of mammals known from the whole Ethiopia. Out of these, 20 species are Ethiopian endemics, representing 26% of the total species reported in the area. This is by far, the highest proportion of endemics. On average, about 10% of the flora and fauna of Ethiopia are endemic. The endemic mammals of the Bale Mountains also 67% of the total endemic mammals recorded in the Ethiopian highlands. Therefore, it has even been concluded that “if conservation efforts are not successful and people continue to exploit the resources in an unsustainable way, more species of mammals would go extinct than any area of equivalent size on the globe. This implies that implementing the project and improving the management of the eco-region helps to save and sustain the lives of these endangered species and their ecosystem functions in accordance with exceptional biodiversity benefits indicators indicated under (GI3) of third edition of CCBA guideline.

xi. **Date of completion (Version 3.5):** 28 July/2016

xii. **Expected schedule for verification** July, 2016

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ACRONYMS

AFOLU	Agriculture, Forestry and Other Land Use
AUDD	Avoided Unplanned Deforestation and/or Degradation
BER	Bale eco-region
BERSMP	Bale Eco-region Sustainable Management Programme
BMERP	Bale Mountains Eco-region REDD+ Project
BMNP	Bale Mountains National Park
CBO	Community based organizations
CEO	Chief Executive Officer
CCBA	Climate, Community and Biodiversity Alliance
CRGE	Climate Resilient Green Economy
DA	Development agent
FAO	Food and Agriculture Organisation
FDRE	Federal Democratic Republic of Ethiopia
FPIC	Free, Prior and Informed Consent
FZS	Frankfurt Zoological Society
GHG	Greenhouse gases
DOS	Dark Object Subtraction
GLCF	Global Land Cover Facility
HCV	High Conservation Value
IDESAM	Institute for Conservation and Sustainable Development of Amazonas
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
CBO	Community Based Organizations
LK	Leakage Belt
LMA	Leakage Management Area
LULUCF	Land Use, Land Use Change and Forestry
LULC	Land use Land Cover Change
MEF	Ministry of Environment and Forest
M&E	Monitoring and Evaluation
NCRC	Nature Conservation Research Centre
NTFP	Non-timber forest products
OFWE	Oromia Forest and Wildlife Enterprise
PA	Project Area
PDD	Project Design Document
PES	Payment for Environmental Services
PFMP	Participatory Forest Management Programme
REDD+	Reducing Emissions from Deforestation and forest Degradation coupled with conservation efforts, sustainable forest management and enhancement of forest carbon stocks.
R-PP	Readiness preparation proposal
ROI	Region of Interest (ROI)
SSLFMP	Strengthening Sustainable Livelihood and Forest Management programme
UNFCCC	United Nations Framework Convention for Climate Change
VCS	Verified Carbon Standard

1. GENERAL

1.1 Summary Description of the Project (G1)

The current level of greenhouse gas (GHG) emissions in Ethiopia is very low, only 150 Mt CO₂e per annum. However, given the high rapid economic growth of the country and under the business as usual scenario, the emission level is predicted to more than double to 400 Mt CO₂e in 2030. Of this, 275 Mt CO₂e or 68.75% will come from the forestry and agriculture sectors. Ethiopia due to its agriculture based economy and rapid population growth has been experiencing high level of deforestation in the order of 140,000 (FAO, 2000-2010 to 163000 ha (Reusing, 1998) per year. Between 2000 and 2008 alone agricultural land expanded in Ethiopia by about 4,000,000 ha, and 80% of this new agricultural land was converted from forests, woodlands and shrublands (CRGE, 2010). In a 'business as usual' growth path, requirement for agricultural land is expected to increase from 15 million ha in 2008 to 34 million ha by 2030, most of the additional agricultural land is expected to come from conversion of forested lands¹ (CRGE, 2010). The majority of forestry and agriculture based emissions in Ethiopia also originate from deforestation within the Oromia State which is the largest regional state in Ethiopia and home to 70% of the remaining high forest cover in the country. One of the major blocks of high forests in Oromia is located in the Bale Mountains eco-region, which is the focus area of this project. Like most part of the country this eco-region has been experiencing high level of deforestation and forest degradation.

Ethiopia has finalized the preparation of REDD+ readiness proposal (R-PP), which was approved by the Forest Carbon Partnership facility (FCPF) of the World Bank in May 2011. In the R-PP document it was clearly explained that during the readiness phase, REDD+ pilot projects will be supported to generate lessons and best practices through learning processes. These lessons will then feed into the implementation framework for a widespread REDD+ frameworks in the country.

One of such REDD+ pilot projects were the Bale Mountains Eco-region REDD+ Project, which is at an advanced stage than any other pilot initiatives that the country expects to generate much lessons from.

The Bale Mountains Eco-region REDD+ Project (BMERP) site lies between 50°22'–80°08'N and 38°41'–40°44'E in Oromia Regional State in south-eastern Ethiopia. The access to the area is by road either using Addis Ababa-Nazareth-Asela-Goba road or Addis Ababa-Shashemene-Assassa–Goba road.

The BMERP area presents very interesting physiographic attributes. The central area of the eco-region is a high plateau much of which is above 3000m asl. Several peaks rise from this plateau including Tullu Dimtu (4377m), the second highest peak in Ethiopia. South of the plateau the land falls steeply into the moist tropical Harenna Forest, that distinctly shows several altitudinal vegetation stratification within short distances starting with mountain grasslands at approximately 3700m, followed by Erica forest, and extending to moist tropical forests of variable species composition such as highland bamboo (*Arundinaria alpina*), *Coffea arabica* and others at the middle altitude, and dryland woodlands in the lowlands below 1500m asl. On the northern aspect the eco-region is characterized by high ridges and broad valleys covered mainly with dry Afromontane vegetation of mainly Juniper (*Juniperus procera*) and Hagenia (*Hagenia abyssinica*) species interspaced with other ecosystems such as grasslands and wetlands.

The eco-region encompasses the largest area of Afro-alpine habitat on the African continent. The forests together with the Afro-alpine plateau are host to a globally unique and diverse fauna and flora, including a significant number of rare and endemic species such as Nyla, Absiniayan wolves and many others. It harbours about 67% of mammals known from the Afromontane eco-region in Ethiopia. It is known as hotspot of medicinal plants of Ethiopia so far identified. It is one of the birth places and centre of diversity of Arabic coffee (*Coffea arabica*) where the species still exists in a wild state. The eco-region belongs to the Afromontane biodiversity hotspot, one of the 34 global biodiversity hotspots. Therefore, the eco-region has critical biodiversity and ecological significances.

¹ **Definition of forest:** Designate National Authority for CDM, EPA, has communicated to the UNFCCC CDM Executive Board the definition of forest used for CDM projects in Ethiopia, which is as follows: •A minimum area of 0.05 hectares; •A minimum tree crown cover of 20 per cent; •A minimum average tree height above 2 m (Ethiopia KP). Available at <http://cdm.unfccc.int/filestorage/L/4/Q/L4QB30W8C5RYZMT6UKOFX1PV9GNIHS/Annex%205%20Legal%20aspects.pdf?t=OXR8bHpgZnlvFDBYMiF2MlecUaf9gv8lJT>

The eco-region is inhabited by about 1.6 million population (urban and rural combined). Moreover around 12 million population both in the eco-region and beyond within Ethiopia, Somalia and Kenya are estimated to directly and indirectly depend on several ecosystem services generated from the eco-region. Particularly, those rural people in the eco-region are directly dependent on the forest and other natural resources of the area. Major livelihoods strategy of the population is cultivation, livestock production and forest based income. The local community depends on the natural vegetation of the eco-region for their livelihoods. Annual direct consumptive use value of the vegetation is valued at US\$ 407 per household from the forests, 228US\$ per household from livestock, and part of the later value also attributable to the forest system as forest grazing is the dominant form of livestock production in the area. Moreover, crop cultivation that provides the highest annual income directly comes from ecosystem services from the forest ecosystem services within eco-region. There is significant potential to improved management of the eco-region to sustain and enhance conservation and the livelihoods of the local community and beyond.

However, the eco-region is facing pressure that is growing over time. This pressure it is experiencing currently will challenge the long term sustainable conservation of this globally unique ecosystem and its biodiversity resources. Between 2000 and 2011, the BMERP area experienced annual deforestation in the range of 1.1% to 6.6%, depending on the forest type and agricultural frontier expansion, with an average rate of 3.7% for the entire eco-region. This rate is almost four times the 1% country-wide deforestation rate (FAO, 2010). This REDD+ project in the eco-region is designed to support the improved management of the eco-region and its biodiversity for multiple benefits that includes climate, community and biodiversity outcomes.

The BMERP will work to improve government and community partnerships on one hand and facilitate the development of community based local institution on the other to result in an improved forest ecosystem and landscape management in the Bale Eco-Region (BER). About 62 local PFM cooperatives will be established and their capacities strengthened (the establishment process already started) to jointly with OFWE manage forests in the eco-region. The BMERP also identified and planed a number of interventions. Through the new form of institutional arrangement and management regime, and project related activities the BMERP aims to avoid unplanned deforestation of considerable area of unique Afromontane forests to reduce the emission of a large quantity of GHG as described below, contribute to the improved conservation of rich and globally significant biodiversity and enhance local livelihoods through the sustainable use and development of local resources including products and services from the forests.

The BMERP is a reducing emission from unplanned deforestation and forest degradation (REDD+) in the Bale massif, Ethiopia. The GHG emission considered is only CO₂ from above ground and below ground biomass pools only. The project period is 20 years which extends from 2012 to 2031.

The historical deforestation rate was established through a multi-temporal image analysis in the Reference Region of the project, which covers the size of 2.08 million ha. The historical deforestation rate estimated revealed the average annual deforestation rates of 1.1% for the Moist Evergreen forest stratum and 6.67% for the Dry Evergreen forest stratum for the period from 2000 to 2011. The primary agents of deforestation in the area are small holder farmers, and the major drivers of deforestation are (i) expansion of agricultural activities (small-holder farming, market driven crops and livestock rearing) into forest lands, (ii) unmanaged fuel wood and construction wood collection from the forest and, (iii) intermittent incidence of forest fires. Those drivers are reflection of several underlying factors principally legal and institutional weakness, demography, market system and poverty.

The Project Boundary of BMERP is 333,924 ha. This project boundary constitutes the Project Area (PA) equal to 261,053 ha of moist and dry forests (238,200 ha of moist and 22,853 ha of dry forests), and 72,924 ha of non-forested land that constitutes the Project's Leakage Management Area (LMA). The PA purposely excluded forests within the Bale Mountains National Park (BMNP). The Project Boundary (PB), PA, Leakage Belt (LB) and Reference Region (RR) are shown in Figure 1. The LB covers all forest and non-forest areas within 6 km buffer around the PA, which are suitable for non-forest use and that, could be deforested by the surrounding community. This has a total area of 398,532 hectares, consisting of 220,010 ha of non-forest, 30,418 ha of dry forest and 148,102 ha of moist forest.

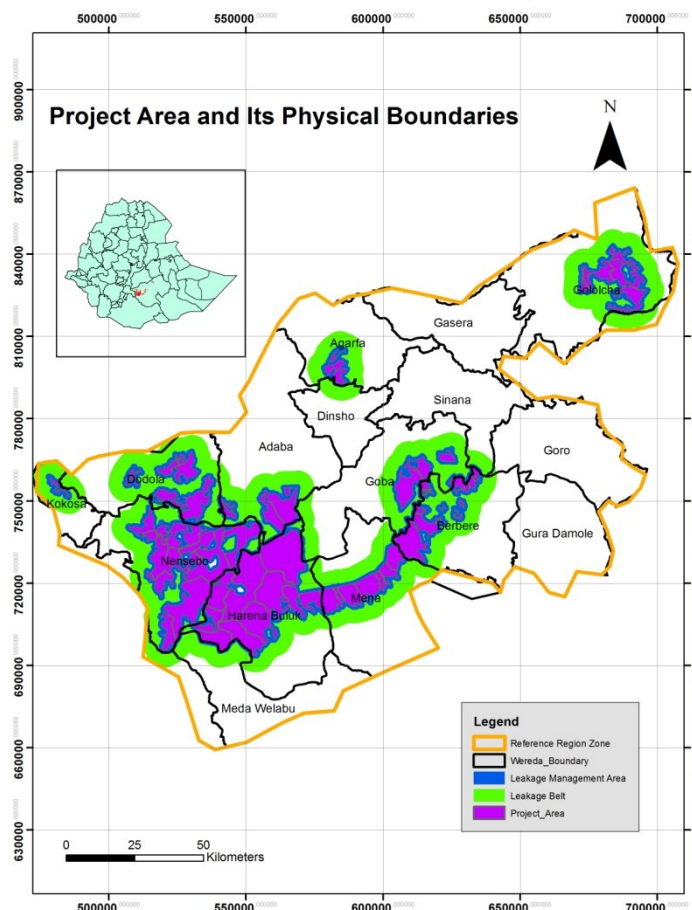


Figure 1: Map of Reference region, project area, leakage belt and leakage management area for the BMERP.

Projection of the deforestation to the crediting period (2012-2031) under the baseline scenario (i.e. business as usual) reveals the likely deforestation of some 84,150 ha of forests (moist and dry forests combined). The deforestation of this much forests in the eco-region will result in the baseline emission of 38321332.28 tCO₂e.

The objective of the BMERP is to prevent this high rate of deforestation and achieve a net anthropogenic GHG emission reduction, which is estimated (ex-ante) 25776421.40tCO₂e. With the buffer for risk of 15%, equivalent of buffer credit of 3866463.21 tCO₂e estimated for the project, the net ex-ante anthropogenic GHG emission reduction under the project scenario will be 21909958.19 tCO₂e.

Project activity

The project intends to achieve its objectives through developing and implementing diverse activities that can address the proximate drivers and underlying causes of deforestation such as:

- Expansion of agricultural activities (small-holder farming, Unmanaged fuel wood and construction wood collection from the forest;
- Intermittent incidence of forest fires;
- Growing population;
- In-migration to the project area from other areas of the country.

Accordingly, the project will leverages a range of social and economic benefits to the local community and thereby confront the ongoing deforestation. Therefore, the designed project activities to this end include:

- Agricultural intensification and provision of economic alternatives to ensure the well-being of local communities;
- Provision of alternative fuel wood and construction poles supply from newly established plantations on non-forest lands;
- Forest Protection and Environmental Measures;

- Strengthening enforcement of existing policies and law, and
- Strengthening the young and weak local institutions and structures for managing forest lands. (Institutional Strengthening of the PFM Cooperatives and OFWE).

The project will also offer significant ecological/biodiversity benefit. It will contribute to the sustainable conservation of the Bale Mountains area as a global hotspot of endemism and high conservation values while improving the livelihoods of the local communities.

Summary of the Bale Mountains Eco-region REDD+ Project

Project duration: 20 years
 Expected deforestation in the baseline scenario (2012-2031): 84,150 ha
 Expected emissions in the baseline scenario: 38321332.28 tCO_{2e}
 Expected deforestation in the project scenario: 27,557 ha
 Expected emissions in the project scenario: 12544910.88 tCO_{2e}
 Expected net emissions reductions from the project: 25776421.40 tCO_{2e}
 Buffer for Risk: 3866463.21 tCO_{2e}
 Area of the REDD+ Project Area: 261,053 ha
 Leakage Belt: 398,532 ha
 Leakage Management Area: 72,924 ha
 Reference Region: 2.08 million ha

1.2 Project Location **G1.3**

1. Location of the project area

The Bale Mountains Eco-region lies between 5°22'–8°08'N and 38°41'–40°44'E within the Oromia Regional State in the Southeast Ethiopia (Figure 2). The access to the area is through either Addis Ababa-Nazareth-Asela-Goba road or Addis Ababa-Shashemene-Assassa–Goba road. The Bale Mountains Eco-region is one of the two highland divisions in Ethiopia, separated from the larger called western plateau of the Ethiopian highlands by the Great African Rift Valley, one of the longest and most profound chasms in Africa and the world. The main central area of the Bale Eco-region is a high plateau, much of which is over 3000 m asl with several peaks rising from it. The highest peak in the eco-region is Tullu Dimtu (4377m), the second highest point in Ethiopia. South of the plateau the land falls steeply to the Hareenna Escarpment and further into the Somali and Borana lowland plains, and further into the Indian Ocean. The northern area is composed of high ridges and broad valleys that gradually descend to the extensive Arsi-Bale plateaus and further into the Central Rift Valley lowlands (Figure 2). The mountains chain and topography with its broad flat plateau has given the Bale eco-region spectacular scenery. The diversity of the landform has also resulted in a diverse soil formation and local climate (influenced by slope and aspect); hence diverse ecosystems and rich flora and fauna diversity. Moreover, the mountains massive of the eco-region play a vital role in climate control of the region by attracting large amount of orographic rainfalls.

The project location is bounded to the north and north-east by the Wabi Shebelle river, to the east by the agricultural plateau on which the towns of Robe and Goba are found, to the south by the lower limits of the forest zone (thus, above the Combretum-Terminalia woodland zone), and to the west by the agricultural plains that are the continuum of the Arsi-Bale plains. Administratively, the area comprises sixteen Woredas namely Agarfa, Dinsho, Adaba, Dodola, Goba, Sinana, Gololcha, Gasera, Delo Mena, Kokosa, Berber, Hareenna Buluk, Nensebo, Mada Walabu, Goro and Guradhamole. In these woredas there are six priority forest areas (PFAs): Aloshe Batu, Goro Bale, Harana Kokosa, Menna Angetu, Kubayu, and Adaba Dodola, which in total are 566,258 ha including the forests in the Bale Mountains National Park or 480,910 ha without the park forests. The total population of the woredas is about 1.6 million, 85% of which is rural and the rest urban.

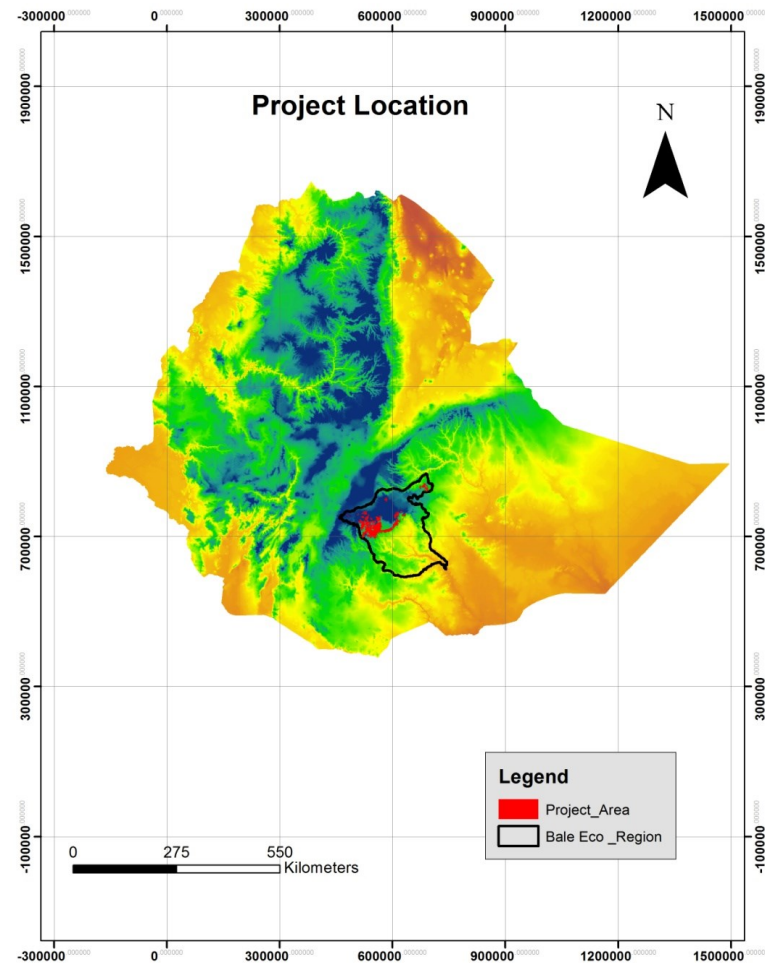


Figure 2. Location of BMERP area within Ethiopia.

2. Basic physical parameters

Climate: Ethiopia's climate in general is extremely varied and despite its location within the tropical region and being close to the equator the country doesn't follow the typical tropical climate pattern. Its local climates are modified by its landforms, i.e. altitude-induced climatic conditions prevail over the country, which is typical also for the Bale eco-region. The vast highland plateau and associated mountains of the eco-region is characterized by a cool temperature and high rainfall, and the high peaks like the Sanetti plateau and Tullu Dimtu could experience snowfalls in winter. Further south of the mountains and down in the lowlands a tropical warm and dry climate prevails.

A bimodal local climate with two wet seasons that have heavy and small rains is characteristic in the eastern part of the project area, while the western part is characterized by a monomodal rainfall pattern. In the part with a bimodal rainfall pattern, heavy rain occurs from July to October, with the highest peak in August and the small rains from March to June, with a peak in April. There are typically eight rainy months (March-October) and four dry months (November-February) in a given year in the part with monomodal pattern. The far south and lower altitudinal areas experience a shorter, four-month rainy season usually from February to June. This lower altitude area receives between 600-1000mm of rainfall annually, whereas the higher altitudinal areas receive between 1000-1400mm. The rainfall is received from two directions -the equatorial westerlies and the Indian Ocean air streams.

Temperature falls with increasing altitude. At the higher altitudes, the lowest temperatures occur at night in the clear skies of the dry season and the highest temperature during the day time during the same season. The daily temperatures during the dry season show high fluctuation. The lowest temperature that has been recorded in the mountains is -15 °C at night, with the highest recorded temperature the next day of +26 °C;

thus a range of 40°C within a 24-hour period. In contrast, the rainy season is mild and the temperature shows much less daily fluctuation. It rarely freezes during the rainy season but also the temperature rarely climbs over 20 °C. The mean annual maximum temperature is 18.4 °C, while the mean annual minimum is 1.4 °C.

Hydrology: The BMERP area holds vast hydrological resources of local and regional significance. More than 40 springs and streams rise in the Bale Mountains that feed five major rivers in the eco-region namely the Webi, Wabi Shebelle, Welmel, Dumal and Ganale (Figure 3 & Table 1). Note on the figure that the source of most of the springs is the plateau where the national park is located. Additionally, the Bale massif is the source for many springs in the lowlands. These rivers and streams are vitally important for the pastoral and agro-pastoral communities inhabiting the semi-arid and arid ecosystems in the lowlands of south-eastern Ethiopia, Somalia and northern Kenya. In effect the Bale Mountains provide many ecosystem services, one of which is hydrological flow regulation that supports large human, livestock and wildlife population in the region. Approximately 12 million people downstream in the Ogaden, Somalia, lowlands of Ethiopia and northern Kenya are dependent on these ecosystem services for their livelihoods. If the flow of the rivers is altered in any way – through deforestation, overgrazing of pastures and/or over abstraction for irrigation (all of which are occurring at present) – a highland/lowland imbalance results with loss of perennial water in the lowlands. If such a situation arises, the dry season range of the people and their livestock reduces dramatically and they concentrate about whatever water source remains. It is widely recognized that such uneven distribution of people and livestock leads to rapid and lasting degradation. The people are, therefore, likely to become increasingly food-aid dependent if the water catchment areas of the Bale Mountains are insufficiently protected. There is already evidence that over abstraction of water in the Bale Mountains is occurring. Furthermore, two rivers emanating from Bale, the Wabi Shebelle and Yadot, (tributary of the Ganale) have hydroelectric schemes.

The Bale Mountains serve as a fallback site for surrounding pastoral communities in search of animal feed and water during drought seasons and years. It is estimated that, theoretically, the value of all direct and indirect ecosystem services of the Bale Mountains together (hydrology, recreation and tourism, crop production, livestock, timber, firewood and non-timber forest products, wild food, medicinal resources, genetic stocks, carbon absorption, electricity production, soil stabilisation, flood prevention, etc.) is at least 812 million US dollar per year, and can add up to almost 1.8 billion US dollar per year.

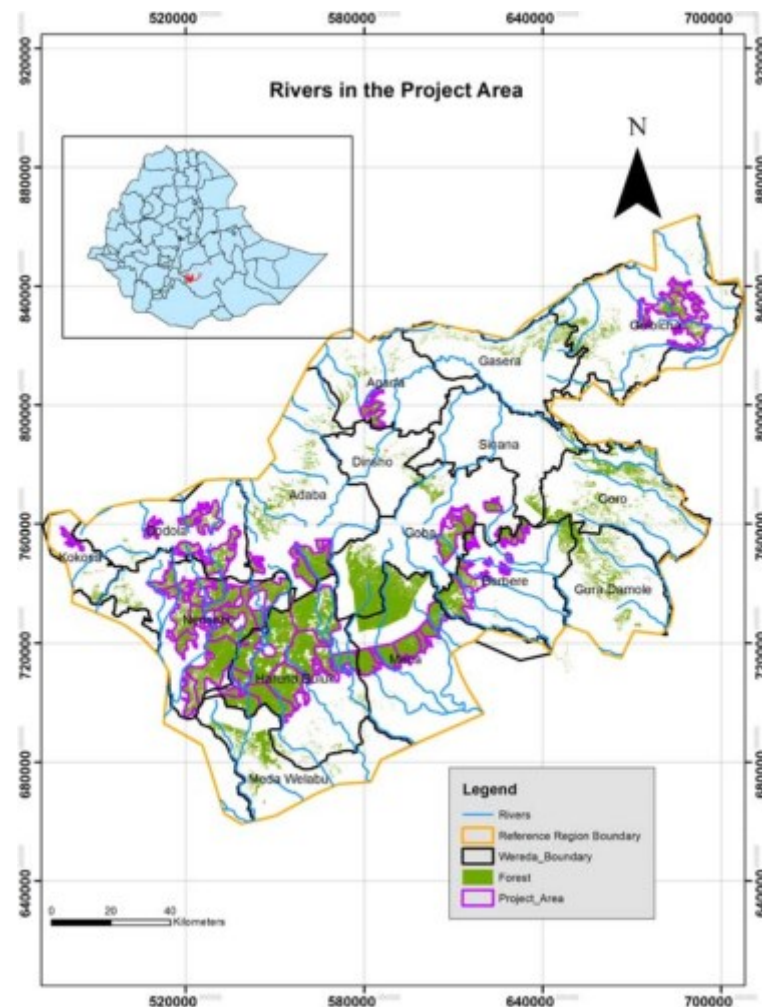


Figure 3. Hydrological Network of the Bale Eco-region

Table 1. Major rivers and their tributaries originating from the Bale eco-region

Major rivers	Tributaries
Wabe Shebele	Abasa, Arba, Baaranda, Boko, Furunna, Gondadoh, Layleeso, and Solay
Web	Albabo, Dalacha, Danka, Dimbeeba, Garano, Gaysay, Kabasha, Kaficho, Keyrensa, Lolla, Micha, Shaiya, Shaiya-Gugesha, Tayanta, Togona, Toroshama, Walla, Wasama, Web and Zetegne Melka
Dumal	Deyu and 5 un-named tributaries
Welmel	Garemba, Rira, Shawe, Shisha and Yadot
Ganale	Welmel and 2 other large tributaries

Geology: The Bale Mountains form part of the Ethiopian highlands system and was formed during the Oligocene and Miocene geological periods, between 38 - 7 million years ago (Miehe and Miehe, 1994). The rocks of the volcanic outpourings are pre-dominantly trachytes but also include rhyolites, basalts and associated agglomerates, and tuffs. The area consists of a vast lava plateau with at least six volcanic cones, each more than 4,200 meters high, which have been considerably flattened by repeated glaciations (see figure 4).

There have been at least two glacial periods in the history of the mountains and they were glaciated as little as 2,000 years ago. During the last ice age, the Bale Mountains were one of the most extensively glaciated areas in Ethiopia with a total area of ice in Bale of approximately 180 km². There was a 30km² ice cap around the peak of Tulu Dimtu (the second highest mountain in Ethiopia) on the Sanetti Plateau and individual glaciers of considerable thickness reached down to 3,200 meters. As a consequence, the

landscape as we see it today is the lava outpourings much modified by over 20 million years of erosion by water, wind and ice.

There are certain geological features that remain an enigma to geologists and glaciologists such as the striations that appear on shallow hillsides on the Sanetti Plateau. Boulder grooves (large stone sorted stripes two to four meters wide and eighty meters long), till ridges and numerous glacial valleys, such as the Togona Valley on the northeast facing slopes of the Sanetti Plateau, provide evidence of the ice-age effects on the landscape. Until the beginning of de-glaciation (13,000 to 14,000 years ago) the snowline was at 3,700 meters and the upper tree limit in the Bale Mountains was well below 3,000 meters. Fluctuations in climate over the last historical period, including the last 3,000 years, have dramatically affected the vegetation and other biodiversity in the highlands.

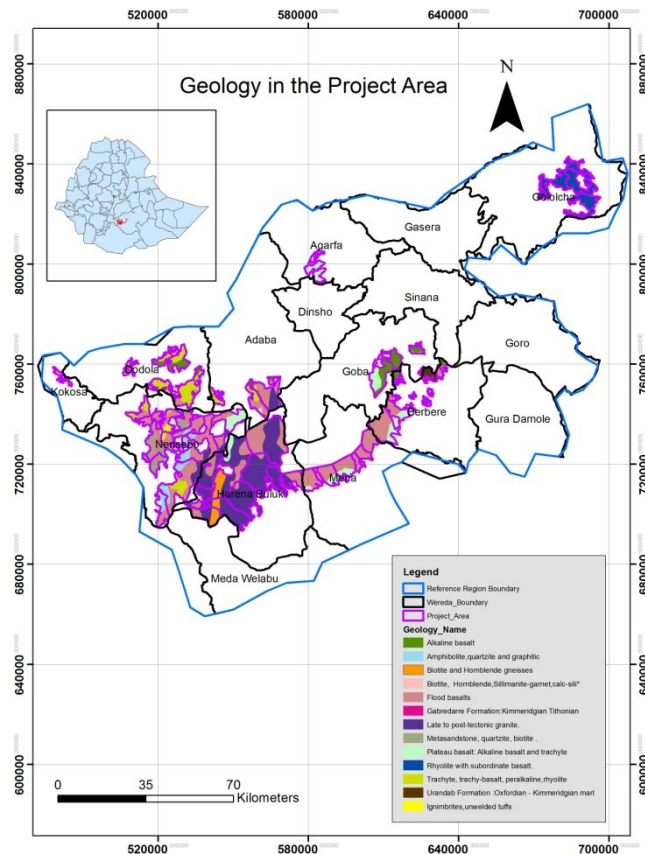


Figure 4: Geology of the Bale Eco-region

Soils: The wide ranges of topographic and parent materials existing in Bale Eco-Region have resulted in wide range of soil formations (Figure 5.). More than 30 soil types are recognized in the eco-region although most of them are found in pocket areas only. The main soil types common in the area are: Cambisols, Vertisols, Luvisols, Lithosols and Nitosols. There is limited information on the conditions of the soils of the co-region due to limited study on soils of the area. However, the Vertisols, Cambisols and Luvisols in the wide plateau of the eco-region are very fertile supporting subsistent and commercial agriculture with high productivity to the standard of the country. There is high potential to boost the productivity of these soils by improving land and crop management. Due to poor management, the soils of these highlands are characterized by low organic matter contents (Yimer, 2007), and also loss organic matter quickly following conversion from grazing and forest land to cropland. Research has indicated that Ethiopian soils including the ones in Bale eco-region are generally low in available nitrogen and phosphorous, and these are priority nutrients recommended for improving productivity. Another constraint is the high rate of top soil erosion by water particularly from the undulating parts of the area. The forests of the eco-region plays significant role in this regarding due to erosion control and regulation of surface run-off.

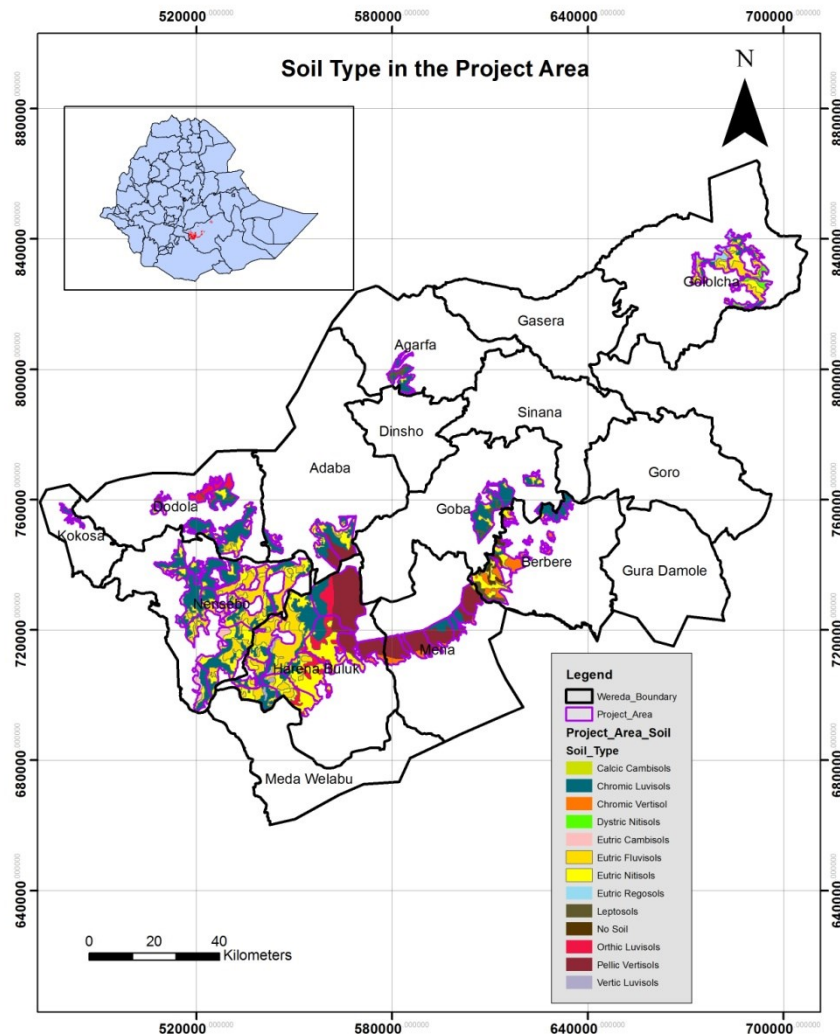


Figure 5. Soil Map of Bale Mountains

Land use: Cultivated lands in the eco-region covers about 15-20% of the land and majorly dominated by small holder subsistent farming system. There is also small large scale commercial farming in the Arsi plateau. The small holder subsistent farming system in the eco-region is typical of the farming system common to most highland areas in Ethiopia. The system is a mixed farming system that combines crop and livestock enterprises. The exact combination of crop and livestock may vary depending on altitude. In the lower altitude areas, bordering the project area, typically below 1500m asl in the southern fringe of the eco-region pastoralism and agro-pastoralism is the typical land use system. The highland farming system may comprise at least three sub-types depending on crop-livestock combinations that are further influenced by altitude. These are: i) livestock-barley subsystem; ii) livestock – wheat/pulse mixed system; iii) livestock-maize/teff subsystem. The livestock- barley sub-system is typical of the cool and humid high altitude areas above 3000m asl with a mean temperature of about 14 °C. Barley, horse, sheep and cattle were the major component of the farming system. In recent years potato is also emerging as important crop in this part. Wheat can also be grown mixed with barley in this farming system. Diversity of crop is very restricted in this farming system due to low temperature. The livestock- maize/teff sub-system is typical of the warm and humid lower altitude area near transition to the hot arid and semiarid lowlands. It is typically practiced in the altitude range between 2000-1500m asl. The livestock-wheat/pulse occupies intermediate altitude range (2000-3000m asl) between the above two sub-systems.

There is a strong interaction between the crop and livestock components of these farming systems. The livestock component provides draught power for ploughing and transport, manure for soil fertilizing, as well as additional income to purchase chemical fertilizers and other inputs. Cultivation is done with oxen that

pull locally made plough called 'maresha (Figure 6). The crop system in turn provides the major supply of feed. Owing to declining grazing land, in most part of the northern section of the eco-region crop residues supply at least 50 % of the annual feed requirements. The farming system in general is characterized by traditional Ethiopian highland practices that involves oxen ploughing, hand weeding, broadcasting and manual harvesting and threshing. Livestock grazing system is also a free roaming. Community focuses on number rather than productivity as having large herd offers culturally a social pride.

The farming system is characterized by low input and low output system. Use of chemical fertilizer is restricted mainly due to timely supply and economic constraints. Market access and agro-industries are yet to be developed.

The natural forests are widely used as forest grazing areas to supplement annual feed requirement for the livestock enterprise supplementing the feed from crop residue and forage from the small grazing land reserves. In addition, the forest system supplies products that generate considerable household income. In fact livelihood activities in the eco-region can better be described as crop-livestock-forest mixed production system. Forestry provides up to 1/3 of annual household income (Tesfaye, 2010; Ameha 2013).



Figure 6. Typical farming system in Bale eco-region

In the southern parts of the eco-region coffee production is one of the major land use system with increasing importance in terms of contributing to household livelihoods. Coffee is produced in the form of small scale garden production system as well as production from natural stands – forest coffee. In this part of the eco-region enset (*Mussa ventricossa*) or false banana cultivation is also observed.

For the pastoral and agro-pastoral communities in the lower altitude areas in the southern part of the eco-region, the high forests (dry and moist) serve as a dry season grazing fallbacks. There is a traditional grazing system called Godantu meaning seasonal migration with livestock, which is a system of moving with livestock particularly during dry season to areas with sufficient feed and water.

3. Boundaries of the Project Area and Project Zone G1.4

The BMERP adopted the VCS vm0015 methodology, based on critical assessment of the various methodological options according to the eight methodological requirements namely scope of activities, baseline, project boundaries, agents and drivers of deforestation, project activities, leakage, monitoring and carbon stocks. Accordingly, the BMERP has the following physical boundaries defined according to the guidelines of this methodology:

Reference Region (RR): This represents the analytic domain from which information about rates, agents, drivers, and patterns of land-use and land-cover change (LU/LC-change) is obtained, projected into the future and monitored. In Ethiopia there has been no nationally or regionally defined sub-divisions that can be used for generating baselines for projects like the BMERP. Therefore, project reference region was defined by the project by selecting areas that exhibit similar ecological characteristics as well as agents and drivers of deforestation with that of the delineated project area (PA). This region included the project area (PA), leakage belt (LK) and leakage management area (LMA) plus some areas around these (Figure 7). The total area of the reference region therefore is 2.08 million ha. This reference region includes extensive dry and moist forests, shrubland (high elevation Erica shrub and afro-alpine grassland land-cover), extensive woodland and agricultural land. It is approximately 8 times the size of the project area and has a perimeter of 3,386 km. The reference region also includes the Bale Mountain National Park, which has exhibited some

deforestation over the historical reference period. The southern limit of the reference region was defined by an elevation cut-off of 1,400 m.

Project Area (PA): This represents forest area that remained forest at least for the past 10 years and represent extension that would be deforested in the baseline scenario of the project based on the spatial model of deforestation. Considering the methodology VM0015 v 1.1 this can include other areas that are not projected to be cleared but are or may be threatened. This is where the project proponents intend to prevent deforestation that would occur in the baseline and account GHG emission reduction benefits. This area totals 261,053 hectares and includes moist (238,200 ha) and dry forest (22,853 ha) strata as identified and mapped from imagery analysis. PA purposely excluded the Bale Mountains National Park area (Figure 7). The PA has remained forested at least for the past 12 years as detected from satellite image analysis.

The project area comprises 261,053 hectares of forest land located within the Oromia Forest & wildlife Enterprise, the project proponent,. The project area including the surrounding project zone forest was given the OFWE as a concession by the government through a regulation № 122/2009. It excludes non-forest land within the boundary (Figure 1). The boundary of the project will be provided to the auditor in a GIS shape file.

Project Boundary (PB): The PB has an area of 481,010 ha and contains forest and non-forest lands. Given that the PA, which is forested area, is 261053 ha this leaves about 220,010 ha non-forested land as the Project's Leakage Management Area (LMA).

Leakage Belt (LB): This represents areas that are at risk of deforestation, surrounding the project area and within the Bale Mountains eco-region. This leakage belt for the project included areas which could be deforested by the local communities living in or surrounding the forest. A mobility analysis, based on experts opinion, was applied (option II, step 1.1.3 VM0015) to define the leakage belt for the project, which resulted in the Leakage Belt with a total area of 398,538 hectares. This area comprised 220,010 ha of non-forest, 30,418 ha of dry forest and 148,102 ha of humid forest.

Leakage Management Area (LMA): These are clearly demarcated non-forest areas within the Reference Region where activities that could reduce deforestation and degradation will take place including agroforestry, agriculture intensification and improve efficiency of cook stoves where those activities are part of the REDD+ investment activities. No emission reductions will be claimed from this area. The LMA of the project constitute a total of 220,010 ha.

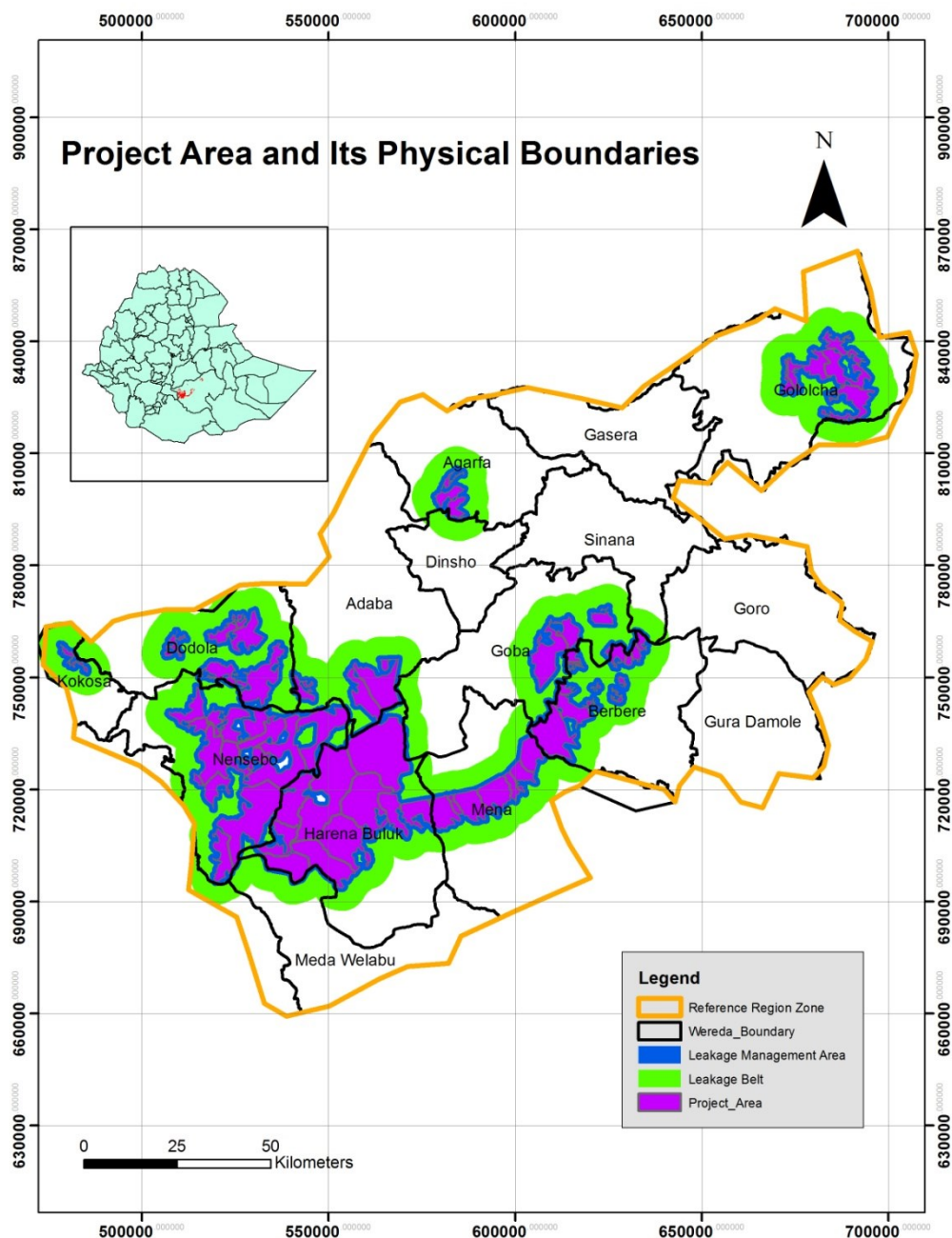


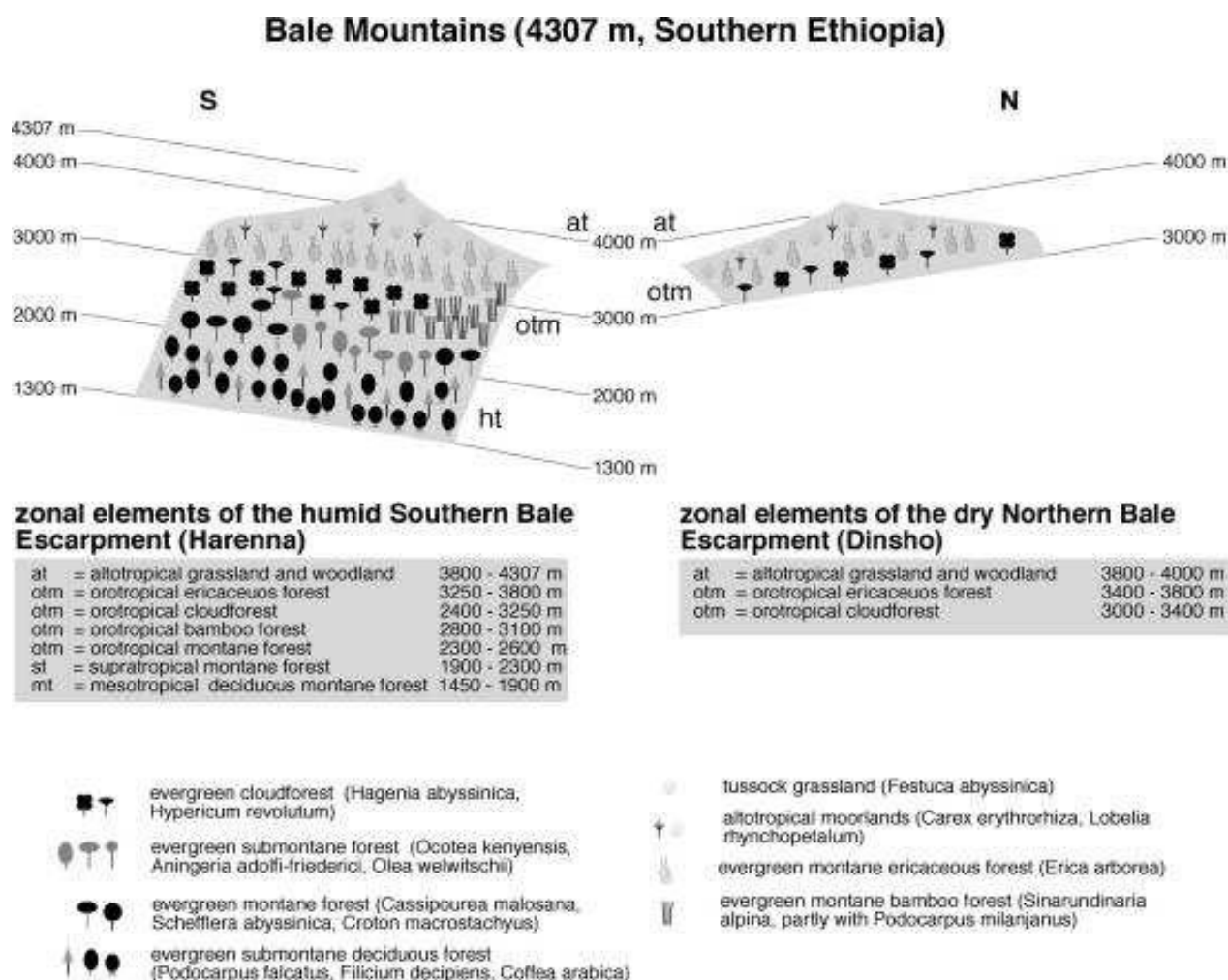
Figure 7. Map of project area, leakage belt, leakage management area and reference region for the BMERP.

1.3 Conditions Prior to Project Initiation (G1.3)

Types and condition of vegetation

The Bale eco-region represents the largest area of Afro-alpine habitat on the African continent. It is endowed with high biodiversity resources that resulted in the designation of its central areas as national parks, called the Bale Mountains National Park (BMNP). It comprises diverse vegetation formation and ecosystems ranging from afro-alpine grasslands, Erica forest, Afromontane high forests (both dry and moist), wetlands and tropical savanna. The forests together with the Afro-alpine plateau are host to globally unique and diverse fauna and flora, including a significant number of rare and endemic species.

A unique characteristic of the Bale Mountains eco-region is the clear vertical stratification of natural vegetation divided into distinct zones along an altitudinal gradient starting from the top of the mountain at 4377m.a.s.l. (Figure 8). Each of these zones has their own characteristics flora and fauna.



As shown in figure 8 the eco-region consists of several vegetation formations: grasslands, shrublands, wetlands and forest vegetation. Two distinct forest vegetation types with significant carbon stock recognized in the Bale eco-region, and relevant for this REDD+ project area the moist and dry forests (Figure 9):

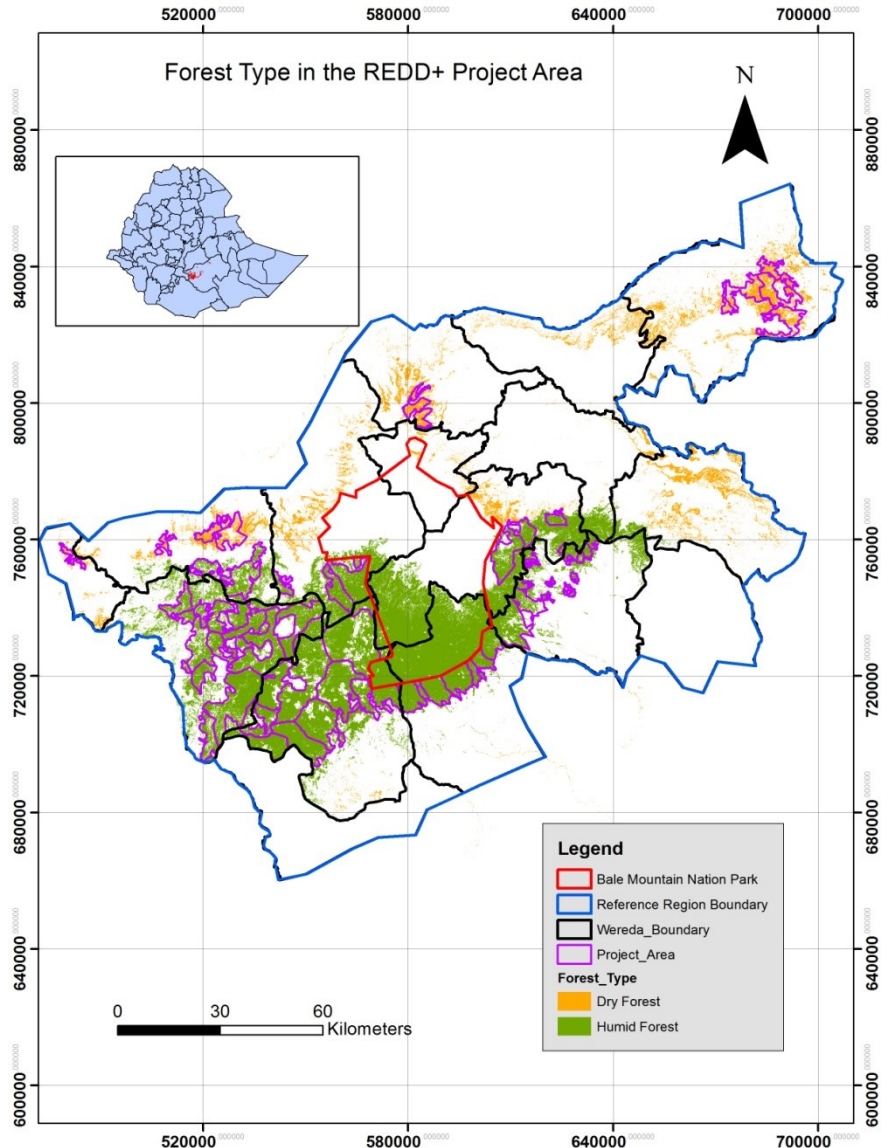


Figure 9. Forest strata and their distribution in the Bale Eco-region

In the following sections details of the natural vegetation in the Bale eco-region including their current status and threats faced are presented.

1. Dry Evergreen Montane Forest: The dry evergreen montane forest is a complex vegetation type occurring within an altitudinal range of 1500-2700 m, with average annual temperature and rainfall of 14-25°C and 700-1100 mm, respectively. The dry evergreen montane forests experience long dry season leading to moisture stress, temperature increases, decrease in daytime humidity, and a drastic decrease or drying up of flows in streams. It also has high population density of cereal-based farming communities, and hence highly threatened with deforestation and forest degradation.

The dry evergreen montane forest is multi-storey forest vegetation. The top storey consists of non-uniform, non-compact layer of tall trees. These trees are known as “emergent” because they project above the vegetation mass. The top storey is mainly composed *Juniperus procera* trees. Below the layer of emergent is a mass of shorter trees of various heights. Still lower is a stratum of short trees and large shrubs that is much less dense than the second stratum. Finally, there is the lowest stratum of shrubs and herbs. Epiphytes, lianas and semi-parasites are also common.

Juniperus procera is the most dominant tree species in this vegetation type. Other emergent trees include *Podocarpus falcatus*, *Oleaa europea* ssp *cuspidata*, *Acacia abyssinica*, *A. negri*, *Euphorbia abyssinica*, and

Apodytes dimidiata. Small trees include *Allophylus abyssinicus*, *Myrsine melanophloeos*, and *Olinia rochetiana*. Epiphytes like orchids, mosses and lichens are common. The shrub layer is primarily composed *Myrsine Africana*, *Calpurnia aurea*, *Dovyalis abyssinica* and *Carisa edulis*. Climbers include *Smilax aspera*, *Urera hypselodendron*, *Embelia schimperi*, *Jasminum abyssinicum* and various species of the *Cucurbitaceae* family. The ground is usually covered with grasses, herbs, mosses and ferns.

This vegetation type also consisted of grassland rich in species including many legumes. Grasslands have come into existence or expanded owing to human interferences. The grasses include various species of *Hyparrhenia*, *Andropogon*, *Chloris*, *Pennisetum*, *Eragrostis*, *Panicum*, *Sporobolus* and many other genera.



Figure 10. Partial view of Dry Evergreen Afromontane forest in Bale Eco-region, South-eastern Ethiopia

2. Moist Evergreen Montane Forest: The Moist Evergreen Montane Forest is in most cases characterised by one or more closed strata of evergreen trees, which may reach a height of 30 to 40m. The moist evergreen montane forest represents the most diverse forest ecosystem in Ethiopia, occurring at altitudes of 1200 (1500)- 2500 m, and receiving the highest mean annual rainfall in the country, reaching up to 2500 mm. These forests are recognized as high forests with closed continuous canopy cover. These forests are the centres of origin for coffee. In many places, the wild coffee stands and canopy trees are managed for commercial coffee production. Hence, though the canopy is closed from the above, the structure beneath it can be highly influenced by management for coffee production.

The Moist Evergreen Montane Forest has 2-3 strata of tree layers: emergent or upper stratum (> 30 m tall), middle tree stratum (15-30 m tall) and small trees and shrubs (2-15 m tall). A few trees of the upper stratum, which are not in lateral contact, are raised well above the middle tree stratum and have large number of branches. The middle stratum is often narrow and can be either discontinuous or continuous. The lower tree stratum usually forms a dense canopy. The herbaceous layer is usually sparse and consists of forest grasses and ferns. Lianas and strangling epiphytes are abundant (partial views of the forests in Bale eco-region are shown in figures 10 & 11).

The emergent canopy or emergent layer of this forest type is usually discontinuous. Emergent canopies are often made up of *Podocarpus falcatus*, *Olea welwitschii* and *Pouteria adolfi-friederici*. Other common canopy species are *Apodytes dimidiata*, *Celtis africana*, *Croton macrostachyus*, *Ekebergia capensis*, *Milletia ferruginea*, *Polyscias fulva*, *Syzigium guinense*, *Cassipourea malosana*, *Elaeodendron buehneri*, and *Schefflera abyssinica*.

The most frequent small tree species include *Allophylus abyssinicus*, *Bersema abyssinica*, *Bridelia micrantha*, *Ehretia cymosa*, *Maesa lanceolata*, *Nuxia congesta*, *Oxyanthus speciosus*, *Rothmannia uncelliformis*, *Teclea nobilis* and *Vepris daniellii*. Wild coffee is one the characteristics species in the understorey between 1000 and 2000 m asl.

Commonly occurring lianas include *Gouania longispicata*, *Hippocratea africana*, *H. goetzei*, *Jasminum abyssinicum*, *Landolphia buehneri*, *Rubus apetalus*, *R. steudneri*, *Tiliacora tROUPINI* and *Toddalia asiatica*. Epiphytes include diverse species of orchids, ferns other groups of plants, including the endemics like *Canarina abyssinica* and *Scadox nutans*.

The forests also serve as habitat for numerous animal species. There are hundreds of bird and mammal species, and most of the endemic species of Ethiopia inhabit highland areas, including the moist montane forests. Large mammals in this forest types include: lion, leopard, black leopard, serval, black common

jackal, wild dog, wild cat, bush pig, giant forest hog, warthog, colobus monkey, olive baboon, bale monkey, Menelik's bush buck, Mountain Nyala, and many others.



Figure 11. Partial view of Moist Evergreen Afromontane forest in Bale, southeast Ethiopia

Current carbon stock:

The current forest areas in the eco-region are 109,892 ha of dry forest and 448,379 ha of moist forest. The current carbon stock in these forests, with above and below ground carbon stock of 141.46 and 237.19 t C/ha, respectively in the dry and moist forests, are 15.5 and 106.3 million tonnes of carbon or a total of 121.89 million tons. For the method of calculation see section 4.5 and 5.3.

Community Information (G1.5):

The community in the BMERP comprises different ethnic groups with the Oromia ethnic group predominant (CSA, 2007: http://www.csa.gov.et/newcsaweb/images/documents/pdf_files/regional/Oromya1.pdf). Other minority ethnic groups include Amhara, Gurage and Sidama. Culturally the Oromia is agrarian practicing mixed crop-livestock system. Cattle are the predominant possession followed by horse, goat and mule in the highland area while in the lowland areas cattle, donkeys and goats are the main livestock types (Flintan et al., 2008).

The majority of the population lives in the highlands due to its good rainfall, moderate temperature and soil favourable for crop and livestock production. The northern and north-western highlands have relatively high population density (82-161 persons per km²). Polygamy type of marriage is widely practiced. The population pyramid in the area shows wider base and narrow tops showing large and growing young population. Household size is on average 6, which is considered high, even at regional scale (CSA, 2007).

According to central statistics agency (CSA, 2007) the total population in the eco region estimated 1,610,102 (811,952 male and 805,701 female) are enrolled in 336,419 house holders. Household size is on average is 6, which is considered high, even at regional scale. The majority of the population lives in the highlands due to its good rainfall, moderate temperature and soil favourable for crop and livestock production. Wealth ranking

exercise done by project and government staffs in REDD+ kebeles for different purpose categorize community into 3 to 4 wealth classes (i.e. rich, medium, poor and/or very poor). Number of livestock, farm and grazing land size, number of hives, housing type (hatch or corrugated iron sheet), number of perennial crops e.g. coffee and fruit trees are major criteria for classification.

All the groups in the area are agrarian practicing mix of crop and livestock production, and forest product gathering. In the context of Ethiopia all people residing in a given forested landscape are characterized as having equal right of access to all natural resources, therefore there is no one described as indigenous.

Current land use and land tenure at the project site (G5):

Land in Ethiopia is a state property. The Government is responsible to administer land and distribute to the public. The Constitution of the Federal Democratic Republic of Ethiopia (FDRE) unequivocally states that land shall not be individual's property. The Constitution indicates that the right to ownership of land (rural or urban), and of all natural resources is exclusively vested in the state and the peoples of Ethiopia. It also asserts the right of Ethiopian peasants to obtain land without payment for grazing and cultivation purposes, and the right to be 'protected' against eviction from the possessions. According to the constitution, transfer of land through inheritance to offspring is possible but transfer to non-family members in any form is prohibited, particularly in sale or other means of exchange, as landholders are restricted only to usufruct rights. Within this broad constitutional framework a Rural Land Administration and Use Proclamation No. 89 was promulgated in 1997 and revised in 2005 with the Proclamation No. 456/2005/1997. These proclamations were issued to provide detail guideline on rural land use rights and obligations. One essential aspect of the latter proclamation in particular is the formalization of closing down on forced redistribution of land, which happened to be a major source of tenure insecurity among the rural populations of the country in the past (Holden and Yohannes, 2002).

The proclamations affirm the use right on land for indefinite period of time for peasant farmers and pastoralists engaged directly in agriculture for living, with the right to pass to family members through inheritance. Access to land for investment is governed by Article 4 of the proclamation. The article states that investors (private, government, non-governmental organizations and social institutions) have the right to acquire land for investment for a definite period only. In the cases of competing claims on land, e.g. between inventor and farm households, priority is given to peasant farmers and pastoralists as per the proclamation.

The proclamations and the law oblige rural landholders to use, protect and manage lands including all natural resources therein properly. Under article 6, the proclamation indicates the need for measuring the sizes of rural lands under the holdings of private persons, communities, governmental and non-governmental organizations as appropriate. Both cultural and modern measuring equipments can be used for the measurement, and the land use capabilities and level of fertility shall be registered in the data base centre by the competent authorities established at all levels, while the holder shall be given cadastral maps showing property boundaries. Following this federal proclamation, four regional states including Oromia state within which the Bale Eco-region is located established Land Administration and Environmental Protection Bureau that administers rural land. The Oromia regional state also issued its respective regional land administration policy, which is more or less similar in content to the federal one.

The main objectives of the federal and regional land administration and use proclamations are to boost the production of food crops in order to attain food self-sufficiency, improve the livelihoods of the rural community, and ensure sustainable growth of agriculture through the promotion of agricultural practices that realizes the conservation of natural resources. The central aim of the land administration and use proclamations and policies is to improve land tenure security among farming households and pastoralists through land registration and certification. The proclamations resulted in land administration and certification reforms, including the establishment of Rural Land Administration and Use Directorate within the Ministry of Agriculture and independent bureaus in the regional states. A number of studies confirmed improvement in the sense of tenure security due to these policy reforms as reflected in increased management effort to maintain productivity of the lands by the owners (e.g. Holden et al., 2008; Gebreegziabher et al. 2010).

With respect to natural resources particularly forestry the ownership remained in state's hand, and there is no usufruct right likewise that of farmland over these resources for rural community. Notwithstanding this, there has been a lot of progress to devolve forest management responsibility as well as right of use through a partnership approach between government and local communities.

Forests in Oromia including those in Bale eco-region are administered in the form of a concession by an autonomous government enterprise called OFWE. OFWE's mandates are to ensure conservation, sustainable development and the use of forest and wildlife resources in its concessions through community participation; to ensure supply of forest products to domestic and international markets by enhancing the forest industry; and subsequently contribute to regional and national socio-economic development endeavors. OFWE works in partnership with local communities and participate those communities in and round forests in forest and wildlife conservation and management activities and in sharing the benefits derived from such management efforts, an approach called Participatory Forest Management (PFM), PFM has been widely practices in Ethiopia, Oromia regional state being at the forefront both in policy reform and as well as widely adopting the scheme.

Participatory Forest Management was introduced to Ethiopia around mid 1990s, and has scaled up rapidly since then to cover most natural forest blocks in the country. One of the two first PFM pilot projects was located within the Bale Eco-region, in Oromia. Through subsequent PFM projects such as the BERSMP the predecessor project to this BMERP project PFM has been up-scaled to cover most part of the Bale Mountains Eco-region. This complemented with this REDD+ project is expected to ensure improved management of the forests in the eco-region. In areas where it has been successfully implemented, PFM has generated real improvements in forest conditions, as well as the economic well-being of the communities living in and around the forests. The approach bridged and catalyzed government and community partnership allowing the former to formally devolve forest use right to generate revenues from products and services obtainable from a responsible forest management (Amaha, 2003; Bekele et al. 2007; Gobeze et al., 2009; Takahashi and Todo, 2012; Kassa et al., 2009). The goal of PFM was to fill institutional vacuum at grassroots level that have been driving high deforestation and forest degradation. Therefore, the BMERP project aims to build on this experience and use PFM as channel to implement improved forest management to achieve climate, biodiversity and community outcomes.

Recognizing the effectiveness of PFM federal and regional governments formalized the approach by integrating it into forest governing policies. The federal forest proclamation (Proclamation no, 542/2007) and proclamations of three regional states (Oromia, Beneshangul-Gumuz and Southern Nations, Nationalities and People) recognize PFM as the pillar of sustainable forest management. In fact, Oromia Regional State is an exemplary in this respect by adopting early and issuing the first ever forest proclamation that recognized communities' right of managing and benefiting from the forests. Therefore, PFM is currently considered as a pillar that establishes a balanced system of sustainable forest conservation and livelihoods for the local communities, and is formally understood as institutional basis on which large scale jurisdictional REDD+ projects are planned such as the Oromia regional state jurisdictional REDD+ project.

Having forest use right through PFM, communities are also having carbon right as well as right to all forest ecosystem generated services. There have been a lot of good practices in terms of benefit sharing arrangement regarding income generated from production of forest products and services from PFM managed forests. Similar principles are also agreed to be followed with respect to the Carbon finance.

Biodiversity Information:

The Bale Eco-Region harbours diverse and unique biodiversity resources at ecosystem and species level. The Bale eco-region belongs to the Eastern Afromontane biodiversity hotspot, which is one of the 34 biodiversity hotspots worldwide due to its exceptionally high levels of biodiversity and threats. It comprises about nine vegetation ecosystems each of which can further be sub-divided into plant communities. The vegetation ecosystems include:

1. Afro-alpine grassland
2. Erica forest/shrubland
3. Mountain grassland
4. Dry Afromontane evergreen forest
5. Moist Afromontane evergreen forest
6. Bamboo forest
7. Combretum-Terminalia woodland
8. Acacia – Commiphora woodland
9. Wetland

The fauna and flora species in the eco-region comprise a large percentage of Ethiopia's endemics, some species of which are only found in Bale. The eco-region harbours about 67% of mammals known from the Afromontane eco-region in Ethiopia. Some key biodiversity resources relevant to the area include:

- The largest area of Afro-alpine habitat (c. 1,000 km² and 17% of the total) on the continent (Sillero-Zubiri et al., 1995);
- Over half the global population of Ethiopian wolves (*Canis simensis*), the rarest canid in the world and which is found only in suitable Afro-alpine habitats of Ethiopia, is located here. The Ethiopian wolf is listed as endangered species by the World Conservation Union (IUCN);
- The largest population of the endemic Mountain Nyala (*Tragelaphus buxtoni*), estimated to be approximately two-thirds of the global population;
- The entire global population of the Giant mole rat (*Trachyoryctes macrocephalus*);
- 26% of Ethiopia's endemic species (1 primate, 1 bovid, 1 hare and 8 species of rodent). Of the area's recorded birds, 6.1% are Ethiopian endemics. In addition there are several rare and endemic amphibian species;
- Haremma Forest and the adjacent Mena-Angetu forest form the second largest stand of moist tropical forest remaining in Ethiopia;
- Bale Mountains is one of the 34 world Biodiversity hotspots;
- Stocks of valuable genetic materials, including wild coffee (*Coffea arabica*)
- Rainbow and brown trout that were introduced into rivers on the north of the massif and provide another potential tourism opportunity if sustainably managed.
- Water tower for south-eastern and eastern lowlands, with a total of 40 springs arising from the area, and feeding into four major rivers that drain into the Indian ocean while serving over 12 million inhabitants in the drier low lying areas;

Over 90% of the original habitat of Eastern Afromontane has been lost or significantly degraded. The Bale eco-region is one of the few places that can represent and significantly contribute to the conservation of biodiversity of such local, national, regional and global significance.

The Moist Evergreen Montane Forest of Bale is one of the sites in Ethiopia that hosts wild gene pool of Arabica coffee. It is the only forest in the south-eastern part of Ethiopia; hence hosts unique coffee genetic resources isolated from bigger wild coffee gene pool in south-western Ethiopia, which is due to the separation of the highland system by the Great Africa Rift Valley.

High Conservation Values (HCVs): The Bale Mountains eco-region has exceptional resource values (ERVs) that are considered to be particularly important in maintaining the unique ecological character and functions of an area and that provide outstanding benefits (social, economic, aesthetic) to local, national and international communities. Being the world's largest afroalpine area coupled with the second largest moist tropical forest in Ethiopia, it represents ecosystem of high biological and ecological diversity comprising numerous flora and fauna resources of high endemic elements as already described in many sections above. Moreover, the Bale Mountain ecosystems are the "Water tower", of the south-eastern drainage system, the largest drainage system east of the Great African Rift Valley serving millions of people in the arid and semi-arid environments from three countries: Ethiopia, Somalia and Kenya; hence significant regional importance. It is the origin of over 40 springs and five major rivers all of which drains into the Indian Ocean. With its spectacular scenery, biological and cultural attractions, the Bale Mountains have been one of the tourist destination as well as a field laboratory for research and academics for national and international scholars. Table 2 below summarizes the top 18 ERVs of the Bale eco-region prioritised into four main categories: natural, scenic, economic and social/cultural. Some detail description of each of the category also provided below.

Table 2. Bale eco-region's list of high conservation values by categories

Category	Exceptional Resource Value
Natural	Endemic, endangered and flagship species e.g. Mountain Nyala, Ethiopian wolf, Giant lobelia, African wild dog
	Afroalpine habitat
	Hydrological system of wetlands and rivers
	Haremma Forest
	Distinct altitudinal vegetation zones e.g. Afroalpine, bamboo, <i>Erica</i>
	Rodent community
	Migratory and endemic birds
	Gaysay grasslands and antelope
	Coffee and medicinal plants

Scenic	Mountain peaks, plateau and lava flows: Chorchora, Rafu
	Alpine lakes and mountain streams
	Haremma escarpment, including Gujerale
Socio-economic	Water catchment (economic value)
	Environmental goods and services such as NTFP, grass, etc.
	Coffee
Cultural	Traditional pastoral transhumance system (Godantu)
	Cultural sites (e.g. Abel Kassim, Gassuray, Alija)
	Traditional ecological knowledge

Natural Values:

The Bale Mountains comprise a nationally recognized park called Bale Mountains National Park. The eco-region in general and the park in particular are centre of endemism, and a critically important area for a number of threatened Ethiopian endemics. The afroalpine area is home to over half the global population of Ethiopian wolves (*Canis simensis*), the rarest canid in the world, and listed as Endangered by the World Conservation Union (IUCN), whereas the northern Juniper-Hagenia woodlands, harbour the population of the endemic and similarly endangered Mountain Nyala (*Tragelaphus buxtoni*), estimated to be approximately two-thirds of the global population. Moreover, 26% of Ethiopia's endemic species (1 primate (Bale Monkey), 1 bovid, 1 hare and 8 species of rodent) are found in the area, including the entire global population of the giant molerat (*Trachoryctes macrocephalus*). Of the area's recorded birds, 6% are Ethiopian endemics. In addition there are several rare and endemic amphibian species found only in Bale as well as 1321 species of flowering plants with 163 endemic (23 to Bale alone) to Ethiopia.

The Bale massif plays a crucial role in climate control in the region, attracting large amounts of orographic rainfall. The plateau of the eco-region is characterised by flat, swampy areas and many small and shallow lakes that are origin for several streams and rivers. The swamps, wetlands and forests are important ecosystems governing water budget particularly by increasing infiltration they are causes for emergence of springs and rivers in the lowlands. Overall a total of c. 40 rivers rise in BMNP area, contributing to five major rivers: the Web, Wabi Shebelle, Welmel, Dumal and Ganale (Figure 12).

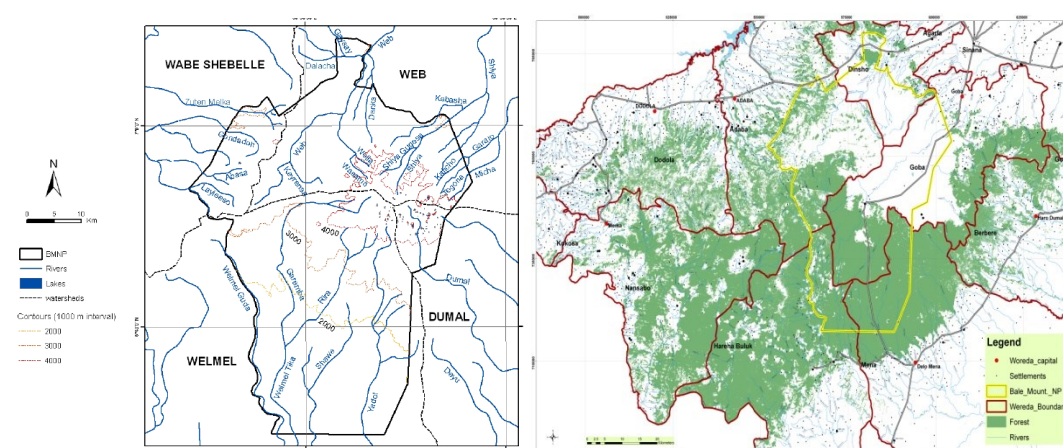


Figure 12. Local rivers and watersheds (Wabi Shebelle, Web, Welmel, and Dumal) in and around the Bale Mountains National Park (adapted from Hillman 1986).

Another natural values of the eco-region is its diverse vegetation ecosystems mainly the distinct altitudinal vegetation zonation. Particularly in the southern aspect of the eco-region there is a distinctive altitudinal vegetation zones as the altitude descends from the afroalpine mountains and plateau at 4300 m to the lowland woodlands down to 1500 m, asl. Within just 60 km road distance several vegetation stratification that covers alpine grassland, giant heather stands of *Erica arborea*, bamboo forest, moist tropical evergreen forests of different zones such as Hagenia dominated communities, *Podocarpus falcatus* dominant communities, etc. until it reaches the Combretium-Terminalia woodland.

The moist tropical forest, which is known by the name Haremma forest, is the second largest stand of moist tropical forest today in Ethiopia. This forest is home to high levels of biodiversity and endemism, including many threatened species such as *Prunus africanus* and *Coffea Arabica*. Lions and endangered African wild dogs are still found in this forest, as are giant forest hogs. The plateau above tree line hosts several Ethiopian endemic species among which plant species such as *Lobelia* spp., and mammals such as the Ethiopian wolf, giant mole rat and other inhabit. Three medicinal plant hotspots have been identified: two in the Gaysay area and one in the Angesu area, spanning the park boundary.

Migratory and endemic birds: Over 170 species have been recorded in BM to date, some 20% of the species recorded for Ethiopia. 57% of Ethiopia's endemic birds are found in the Bale Mountains, such as Rouget's rail, spot-breasted plover, blue-winged goose, the black headed siskin and white-backed black tit. The area, with its abundant rodent community, is also very important for many internationally rare large eagles, vultures and other raptors. Bale is also the only known breeding site for a number of Eurasian species, such as the golden eagle, the ruddy shelduck and choughs. The park also has breeding populations of another species, the wattled crane, the only known site out with southern Africa. In addition, it is an important over-wintering ground or passage station for migrants from Eurasia, particularly passerines and waterfowl.

Alpine lakes and mountain streams: The alpine lakes and mountain streams are a key feature of BMNP and, as well as providing vital habitat and ecosystem services, are an attractive scenic feature in their own right. Access is good to small lakes on the Sanetti Plateau and these draw birdwatchers and other tourists. In the Haremma Forest and Gaysay area, walkers along river banks can be rewarded with stunning waterfalls and attractive water flows and scenery.

The Haremma escarpment: The Haremma escarpment falls away rapidly from the southern edge of the mountains and Sanetti plateau, from 3,500 m eventually to 2,000 m asl, over a distance of just 8km. When not cloaked in mist or cloud, the cliffs of the escarpment offer impressive views to the south.

Socio-economic Values:

Water catchment: The Bale mountains eco-region is the source of water for five major rivers (the Wabi-Shebelle, Web, Welmel, Ganale, and Duma) on which an estimated 12 million people depend. The afroalpine wetlands and the Haremma forest hold the water, releasing it year round to the arid and semi-arid areas of south-eastern and southern Ethiopia, including the Ogaden and Somali agricultural belt. The livelihoods and food security of the people in these lowland areas are highly dependent on good environmental management in the highland areas. Water flow is regulated and stabilised in the dry and rainy season through the water retention properties of the highland wetland areas and dry season rainfall in the mountains is crucial to maintain river flow. Overuse of this system would make the water flow seasonal, increase flooding and decrease dry season water availability. In turn this would rapidly increase degradation of rangelands surrounding the few areas with permanent water and increase food aid dependency, a scenario that has already developed in northern Kenya.

Environmental goods and services: The eco-region and its surrounding areas provide a range of goods and services both locally and nationally, in addition to water provision. Indeed most of the local communities are partially or almost entirely dependent on natural resources in the eco-region. For example, the natural ecosystems provide grazing ground for livestock herds, and a variety of non-timber forest products (NTFP) such as honey, medicinal plants and coffee and also wood products to support local livelihoods.

In addition, two of the rivers flowing from the eco-region have hydroelectric schemes: the Melka Wakana scheme on the Wabi Shebelle and the Yato mini-scheme on the Yadot River. The produced hydroelectricity supplies the towns of Dodola, Adaba, Dinsho, Robe, Agarfa, Ali, and Goba, and Dola Mena respectively.

The area is also an important climate change reference area. With global warming increasing, climate records of the Bale Mountains will be vital in determining how climate change will affect the afroalpine areas over the forthcoming decades.

Wild coffee: Coffee plays a vital social and economic role in Ethiopia and is part of the national identity. It is also extremely important economically, being a major foreign currency earner. A considerable amount of wild coffee is harvested in the Bale Mountains, and this provides a significant income source for many local

communities. However increasing forest and semi-forest coffee management needs to be managed to ensure that biodiversity in the forest is not adversely affected.

Cultural Values:

Traditional transhumance system (Godantu): The transhumance system of Oromo pastoralists is known as the Godantu system and is a key feature of traditional human use of the Bale Mountains. In this system, livestock, particularly cattle are sent to higher grazing grounds during the months when crops are growing in lower altitude areas or into the forest for shade during the dry season.

The Bale Mountains is relatively environmentally intact. The area is not blighted by an ancient history of cultivation agriculture, land degradation, recurrent drought and chronic food insecurity. However, negative pressures on natural resources in the Bale Mountains are rapidly growing. Unsustainable natural resource exploitation and degradation throughout the area is increasingly threatening the sustainability of the environment, food security and sustainable livelihoods. As a result, the survival of the unique and globally significant fauna and flora of the area is threatened.

Bale's rural communities are seeking to meet their livelihood needs by expanding exploitation of local natural resources. Resource exploitation mechanisms are opportunistic and unregulated. Agricultural land started expanding rapidly, as grazing areas are heavily degraded pushing pastoralists towards new pastures. Forest areas are being cut and cleared, and water systems disrupted. Resource users are taking advantage of the *de facto* open access resource management regimes in the area. There were no land use management plans. Land use rights and ownership was confused and there was no control of resource use. Rapid immigration with unplanned and unrestricted settlement is a significant and mounting problem. Existing settlements are growing, and new settlements are appearing in previously unsettled and environmentally sensitive areas.

The forest area in the Bale Mountains has been shrinking as the result of conversion to agricultural land by subsistence farmers. The types of the subsistence farmers, which are the key agents of drivers of deforestation, were local farmers, migrants from other parts of the country, and agro-pastoralists in the lowland areas surrounding the project area/s. Before the project was started:

- Local farmers were converting the forest land to agricultural land for subsistence farming
- The migrants, most of the time settle deep in the forest and/or join some their relatives already existing in the area and further expand the farm land at the expense of forest land. They also build new houses in the forest

As there are weak law enforcement with regards to the illegal migrant from different area and the increasing demand for the new land for subsistence agriculture, it is less probable to stop the expansion of deforestation, where the entire reference region is susceptible for conversion to the current land-uses in the baseline scenario.

Nonetheless, the eco-region has been exposed to various threats that degrade and deforest its natural forests. Main threats are expansion of small holder farms and unsustainable harvest of wood from the forests. The forests are experiencing high rate of deforestation: between 1986 and 2009, annual deforestation in the Bale Mountains ranged from 1% to 7% depending on specific site context, with an average rate of 3.7% across the co-region (Watson et al., 2013), almost four times the 1% country-wide forest loss (FAO, 2010). There has been attempt since very recently to slow down this high rate of deforestation through PFM model of forest management. This deforestation in the second largest stand of moist forest in Ethiopia, driven mainly by factors such as poverty, poor land management and productivity, weak policy implementation arrangements and capacity gaps, threatens a wealth of ecosystem services. Loss of biodiversity, acceleration of soil erosion and flooding, decline in quality and quantity of several other ecosystem services including emission of GHG are some of the consequences.

Agricultural land is expanding by cutting and clearing natural forests (Figure 13). Resource users are taking advantage of the *de facto* open access resource management regimes in the area. There were no land use management plans. Land use rights and ownership was confused and there was no control of resource use. Rapid immigration with unplanned and unrestricted settlement is a significant and mounting problem. Existing settlements are growing, and new settlements are appearing in previously unsettled and environmentally sensitive areas.

In response to these adverse threats to the eco-region the Oromia Regional Government has attempted to take concrete actions in recent years through policy and institutional development reforms. Establishment of Oromia Forest and Wildlife Enterprise (OFWE) is one of these concrete actions taken. However, capacity and resources are still major limiting factors for OFWE to achieve significant outcome in improved management of the forests and associated natural resources in the eco-region. This BMERP is designed to create a sustainable financing mechanism to help government and local communities build capacity and fill critical resource gaps to bring meaningful changes in the management of natural resources and forests in the eco-region.

The BMERP will build itself on works under implementation in the eco-region. From 2007 - 2012, Farm Africa/ SOS Sahel Ethiopia in partnership with the Oromia Forest and Wildlife Enterprise implemented the Bale Eco-Region Sustainable Management Programme (BERSMP), supported by the Netherlands, Norwegian and Irish Embassies in Ethiopia. The programme aimed to contribute to the conservation and sustainable development of the unique biodiversity and ecological functions of the greater Bale Mountains Eco-region, whilst establishing and enhancing sustainable local livelihoods. The idea was to involve local communities into a central role in the sustainable management of the area, and as the natural resource management leaders, supported by government services, across the whole Bale Massif. The Bale Mountains Eco-Region REDD+ initiative started as part of the bigger programme to address the financial sustainability of the programme.



Figure 13. Agricultural frontiers expansion into moist forest of Hareenna, Bale Eco-Region

There has been little active or effective management of natural resources in the area. Unsustainable exploitation and degradation throughout the eco-region is increasingly threatening the natural resources thereby the livelihoods of the local people that directly dependent on them as well as the very survival of a unique biodiversity resources whose economic potential as a basis for tourism in particular remains unfulfilled. Under business as usual, the3 eco-region will be on the verge of significant degradation threatening not only the unique biodiversity of the area but livelihoods of millions of community that directly and indirectly depend on goods and services from the eco-region. Action should be taken urgently to save this globally important ecosystem.

1.4 Project Proponent G1.1

The BMERP proponent is the Oromia Forest and Wildlife Enterprise (OFWE), an autonomous fully government-owned enterprise, established with regulation number 122/2009 issued in July 2009 by the Oromia State Council under the Federal Democratic Republic of Ethiopia. The Oromia Forest and Wildlife Enterprise owns concession for all of the forests and regionally administered wildlife related conservation area in Oromia State. The concession area of OFWE covers a total of 367,700 Km².

OFWE's mission is to undertake conservation, sustainable development and utilization of the forest and wildlife resources in its concessions through community participation; ensure supply of forest products markets and services to domestic and international markets by enhancing forest industry; and subsequently contribute to the regional and national socio-economic development endeavours.

The project proponent, OFWE, is currently responsible for the management of all forests in Oromia regional state of Ethiopia. The forests were given to OFWE by concession to administer and manage it. OFWE has 9 branch enterprises, where Bale Mountains REDD+ mountains REDD+ project fall in two of the forest enterprises: Arsi and Bale branches. The two branch enterprises with the OFWE headquarter support will be responsible for the implementation of the BMERP.

In line with this they will perform the following:

- developing work plans and budgets
- implementation of activities such as law enforcement, community nursery establishment and management
- support community forest management groups in the implementation of participatory forest management
- closely work with legal bodies to enforce law
- ensure participation of other government agencies such as the office of agriculture, energy, etc in the project implementation
- coordination of involvement of non-governmental organizations

OFWE staff profile:

OFWE has a total of 3543 staffs working in the different branch offices and districts, out of which 117 staffs are directly related to the Bale Eco-Region. These are working in two of the branch offices in Bale and West Arsi within which the Bale eco-region forests fall.

Besides their professional background and skill in forest and biodiversity management the Bale REDD+ project has also provided series of training to build the capacity of the OFWE in REDD+ project management and implementation. The Bale and Arsi branch office OPFWE staff were the one that conducted the forest inventory work for the development of this PDD as well.

The Bale REDD+ piloting project (2012-2015) has also developed and is implementing Government and Community staff capacity building plan (Government and community capacity building plan supplementary material 25).

Farm Africa and SOS Sahel-Ethiopia, who supported OFWE in the development of the Bale REDD+ pilot project and this PDD are also supporting the proponent in implementing the project activities until 2015, and beyond through their current projects such as Bale REDD+ pilot project and SHARE projects (additional documents enclosed as references). This will also strengthen the proponent in developing additional capacity.

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1.5 Other Entities Involved in the Project G4.1

Farm Africa/SOS Sahel Ethiopia

Technical skills: Farm-Africa and SOS Sahel Ethiopia commenced the Participatory Forest Management Programme (PFMP) in Ethiopia and Tanzania. Currently both organizations are implementing Bale Eco-region Sustainable Management programme in the Bale Mountains massif at a landscape level and Strengthening Sustainable Livelihood and Forest Management programme (SSLFMP) in four regions of Ethiopia.

Functions in the project: Farm Africa/SOS Sahel Ethiopia through the Bale Eco-region Sustainable Management Programme (BERSMP) has been key organizations for development of the Bale Mountains Eco-region REDD+ project (from Feasibility study through PDD development). The two organizations are also supporting the government and the local communities, Joint Forest Management (JFM) cooperatives, in the implementation of the project activities, particularly in capacity building of both institutions.

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Joint Forest Management Cooperatives (JFMCs) and local communities outside JFMC

Joint forest management (JFM) cooperatives are community based organizations (CBO) established and certified by the Oromia regional state Cooperative promotion office. The JFM CBOs, after getting certificate of formal institution, sign a forest management agreement with the Oromia Forest & Wildlife Enterprise to jointly manage the forest in their territory/kebele. The activities they do are sustainable forest management: forest protection, development, utilization, and M&E.

Functions in the project: The JFM CBO members will protect the forest from illegal logging to reduce the current level of deforestation and supporting natural regeneration by preventing grazing in the area.

JFM Cooperatives

Address: currently not applicable

T: n/a

F: n/a

E: n/a

Ministry of Environment and Forests (MEF)

The Ministry of Environment and Forests, use to be the Environmental Protection Authority (EPA), is the Designated National Authority (DNA) which oversees the design and implementation of REDD+ in the

country and supports the implementation of REDD+ pilot projects. The REDD+ secretariat for Ethiopia resides within the Ministry.

The secretariat will be fully engaged with the REDD+ project design and implementation and ensures that the various systems laid by the project such as MRV, benefit sharing mechanisms are in line with the government's R-PP and is implemented accordingly. The secretariat will also provide the necessary high level technical and policy support that is required both by internal and external bodies during implementation of the project. The focal point will also provide the no objection letter for the completed project design.

Ministry of Environment and Forest (MEF)

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Consortium of Consultants Involved in the Project Design Document preparation

Nature Conservation Research Centre (NCRC)

Functions in the Project: Provided support in the Carbon stock assessment design and led the consortium

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Functions in the Project: Advise on Methodological review, and PDD review.

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Functions in the Project: Analysis establishment of baseline Deforestation and future deforestation projection

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1.6 Project Start Date (G1.9)

Early work of the project began as far back as 2007 such as the process of participatory forest management systems, capacity building trainings for government partners and communities. However, the start date of the BMERP is set to be as of January 1, 2012.

The project start date is 1 January 2012. There have been different projects taken place prior to this date, however, the date was chosen to mark the commencement of effective implementation of the project

activities that leads to reduced emission from deforestation and hence generate carbon credit. January 01, 2012, as the beginning of the next management chapter, marks a convenient point to use for accounting purposes.

In addition 2012 is fixed as project start date because:

- It marks the actual completion of CBO establishment across the eco-region and official starting of operation in forest management plan implementation on the ground that could lead to emission reduction or avoidance of deforestation;
- FPIC process and benefit sharing negotiation between community and government parties were started in 2012, and
- PDD development processes started

The key Milestones and Dates in BMERP Implementation are presented in Table 3.

Table 3: Key Milestones and Dates in Project Implementation

Milestone	Date
Early actions by OFWE and Farm Africa to determine project feasibility	2008
Project Start date	January 01, 2012
Project Crediting Start	January 01, 2012
Establishment of PFM Cooperatives and Formal Agreements with OFWE for joint forest management	June 2009 – December 2012
PDD development process	November 2011 - September 2014
Begin investments and project activities financed by investment (see Appendix for implementation schedule)	October 2012
Constitution of Bale Mountains Eco-region Trust Fund	December 2014
CCB and VCS validation	May 2014
First forward sale of Emissions Reductions (expected)	June 2014
Monitoring (per the monitoring plan)	June 2014 and every year for deforestation and five years and thereafter for carbon stock increase.
Verification	December 2015, and every Five years thereafter

In 2009 OFWE and Farm Africa/SOS Sahel Ethiopia established the first PFM/JFM cooperatives in the area for the effective implementation of participatory forest management that contributes to avoided deforestation. During the same year the 1st PFM/JFM agreements were signed between the CBO/s and OFWE to jointly manage the forest (Sample Joint Forest management agreement (JFMAs) signed between forest cooperatives and OFWE: Supplementary information 20). The project crediting period will begin after the project start date.

1.7 Project Crediting Period (G1.9)

The BMERP crediting period (life time) will 20 years starting from January 01, 2012 – December 31st, 2031.

2 DESIGN

2.1 Sectoral Scope and Project Type

The project falls within the scope of the AFOLU sector (Agriculture, Forestry and Other Land Use), and in the category of Reducing Emissions from Deforestation and Degradation (REDD) in particular. The proposed type of activity is Avoided Unplanned Deforestation and/or Degradation.

The project is not a grouped project.

2.2 Description of the Project Activity (G1.8)

The project is designed to achieve multiple outcomes that bring climate, biodiversity and community benefits. As described above the Bale Mountains Eco-region has high conservation value. The project activities therefore are designed to consolidate improved landscape and forest managements by accessing REDD+ finance to ensure sustainable financing of the various natural resources management activities planned to reduce deforestation and forest degradation and contribute to sustainable rural development in the Eco-region.

From the climate benefit point of view the project will avoid 57853ha of deforestation of tropical forest, equivalent of 68.2% of the deforestation expected under the business as usual scenario, by strengthening community based institutions in which communities in and around the forest are organized and assume responsibility and right of management and benefiting from the forest and carbon finance. This will fill the gap of institutional vacuum that in the past has driven deforestation. By saving the 57853.13 ha of forest from being deforested the project area will reduce emissions of about 36 MtCO₂e over the coming 20 years.

The project designed its activities to address the identified proximate and underlying drivers of deforestation in both project area and leakage belt through leakage management area, which include:

- Expansion of agricultural activities by small-holder farming,) into forest lands (small holder farmers are local, migrants and seasonal settlers);
- Fuel wood and construction wood collection from the forest for household consumption and market;
- Intermittent incidence of forest fires;

The set of activities designed around these pillars will dramatically reduce deforestation in the BMERP by confronting its four main roots:

- absence of economic alternatives to ensure the well-being of local communities;
- absence of alternative fuel wood and construction poles supply from non-forest lands;
- weak enforcement of existing policies and laws;
- young and weak local institutions and structures for managing forest lands

The main project activities are therefore designed taking into consideration these drivers of deforestation to reduce their impacts in the BMERP. The designed project activities are categorized into five major categories namely:

- Agricultural intensification and provision of economic alternatives;
- Provision of fuel efficient technology and alternative supply wood for fuel wood and construction materials from non-forest lands

Implementation of sustainable forest management, conservation and Protection and support for effective law enforcement Institutional Capacity building for government and JFM community

For each strategic component, several specific activities were identified. Table4.provides the details of activities and summary of budget break down for implementation of the first five years of the project phase. The detailed implementation plan and budget are provided (Supplementary documents 21: Five years detailed project activity implementation plan and budget breakdown).

Table 4. Activities planned for the project and expected impacts to climate, biodiversity and community

Project Activity Pillar	Objective	Specific Activities	Expected impacts	5 Year Cost of Activities
Agricultural intensification and provision of economic alternatives to ensure the well-being of local communities	Intensify agricultural productivity on existing farmlands and reduce horizontal expansion Generate additional income from other non-farm based sources in order to diversify livelihoods activities	Integrated soil-crop management (improved variety, organic farming, intercropping, agro-forestry, Support annual individual kebele-level performance grants; Support livestock and range management measures; Support poultry farming activities; Support improved cereals and fruit tree crop activities; Support critical alternative income generation research in the BMERP area.	Increase productivity of agricultural land and decrease forest encroachment. Deforestation and forest degradation decreases Rural community household income increased	US\$ 3,894,000
Provision of fuel efficient technology and alternative supply wood for fuel wood and construction materials from non-forest lands	Increase supply of firewood and construction material from outside the project area forest and increase efficiency of fuel wood energy use	Establish plantations, assist establishment of community woodlots, agro forestry, improved stoves introduction, promotion and dissemination		US\$765,000

implementation of sustainable forest management, conservation and Protection and support for effective law enforcement	Support the OFWE and its partners including PFM Cooperatives in monitoring, surveillance and protection activities for the forests Improve forest and related law enforcement and reduce illegal forest encroachment	Support and strengthen PFM cooperatives Enhanced forest patrols to reduce illegal activities; Implement forest fire prevention activities; Support rapid development of household and community woodlots; ; Support education and awareness campaign in BMERP communities; Support critical biodiversity research and monitoring in the BMERP area Build community capacity on forest resource and carbon stock assessment, forest fire management and protection, etc Revise and improve existing forest and related policy frameworks that takes into consideration REDD+ projects; Training for law enforcing agencies Establish platforms of law enforcing agencies, OFWE administrators and other government agencies at various levels (local to regional level) Establish effective information-communication system	- Reduce illegal encroachment to forest concessions; - End illegal logging in forest concessions; - Forest stocks conservation in forest concessions and woodlots; - Biodiversity conservation improved	US\$ 432,000
Institutional Strengthening of the PFM Cooperatives and OFWE	Contribute to successful implementation of sustainable natural resource use in the BMERP area through institutional strengthening of PFM and OFWE structures	Support annual PFM Association grant; Support annual PFM Cooperative performance grants; Support regular meetings and record-keeping of the PFM cooperatives; (OFWE strengthening??) Support strategic lobbying activities to Regional State and Federal levels.	- Improved communication and operations of PFM cooperatives and JFM cooperative union; - Strengthening unity among cooperatives through operation of Association; - Improved performance and accountability of OFWE systems; - Adequate training of associations to carry out its actions; - Increased	US\$ xx 635,000

			awareness of critical issues to state and federal officials.	
Development and Implementation of Bale Mountains Eco-region Fund	Development and implementation of Bale Mountains Eco-region Fund for the financial management of the BMERP	Support design and set-up costs for legal establishment of Bale Mountains Eco-region Trust and Fund; Support regular meetings, administrative support, and record-keeping of the Board of Trustees; Support participatory planning processes from kebele level up to Board of Trustees level; Support validation, annual audit, regular verification, banking fees and other transaction costs; Support semi-annual/annual independent monitoring of BMERP indicators and milestones.	- Ensuring long-term financial sustainability; - Bale Mountains Fund operational zed; - Monitoring and reporting of results; - Participatory process operating.	US\$ 280,000

The Bale Mountains Eco-region Fund

The BMERP Financial Mechanism will distribute assigned functions between different institutions and decision makers involved in implementing this project. The governance structure (Figure 14) and the fund flow structure (Figure 15) are based on four pillars: the deliberating bodies, advisory bodies, implementing institutions and local managers of the project and the funding.

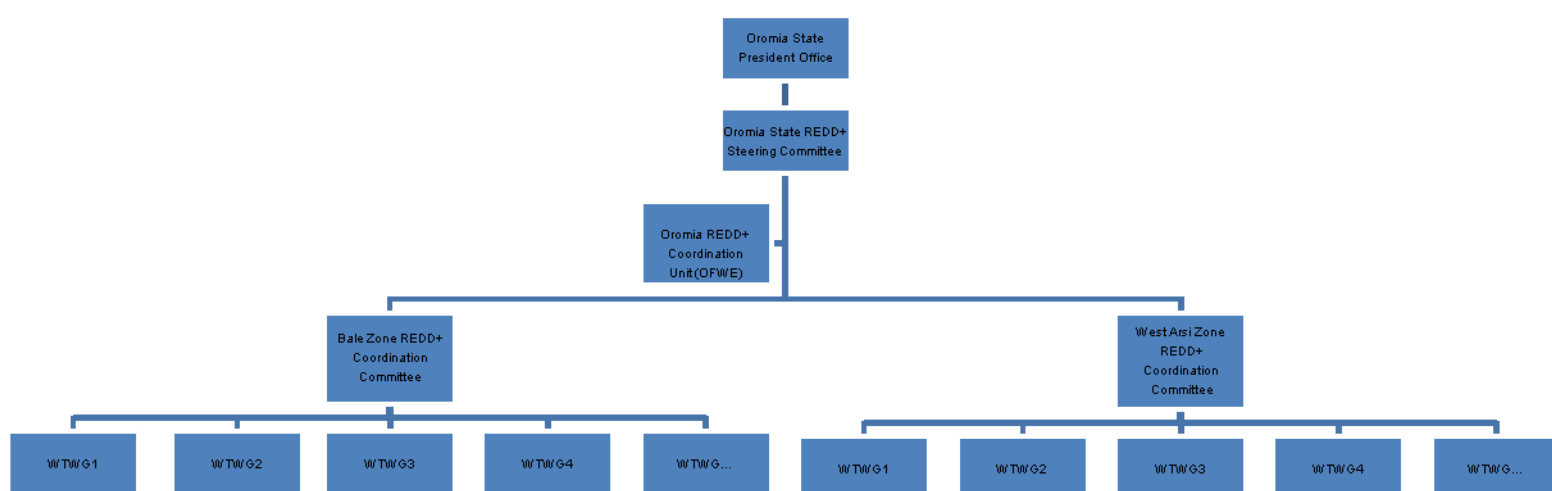


Figure14: Governance Structure of BMERP

The management and operation of the project Fund is the responsibility of OFWE, the proponent of the project, which will make the flow of fund to the forest unions and cooperatives at the project sites according

to the planned project management activities agreed and schedule between OFWE and local community as well as benefit sharing arrangements.



Figure 15. Governance Model for the Bale Mountains Eco-region REDD+ project Fund

2.3 Management of Risks to Project Benefits (G1.10)

Stakeholder engagement began in the project zone in February 2007, through a series of awareness-raising and community engagement meetings that promoted understanding about Participatory Forest Management (PFM) and sustainable financing options through REDD+ in the Bale Mountains Eco-region of Ethiopia. The concept of the Bale Mountains REDD+ project was presented to the national stakeholders (public, civil society, and private sector) during the Ethiopia REDD+ R-PP workshops.

In the project zone comprehensive and wide awareness creations and trainings were provided to all relevant government stakeholders and wider community on climate change, role of forest in mitigating climate change, concepts and principles of REDD+, and the benefit and risks of the proposed BMERP to the local stakeholders in general and the forest dependent communities following the principle of Free Prior and Informed Consent (FPIC) and based on a comprehensive Community Engagement Strategy. Consultations were conducted in each kebele/village in and around the project areas and meetings were held in the appropriate local language (Afan Oromo), using written materials and workshops.

After each meeting, a voluntary vote was taken to allow participants to express their approval or rejection of the REDD+ project. Community consultation is an on-going process, and the project continues working with the local relevant community groups needs to be consulted about the BMERP.

However, the following risks were identified as a potential risks to be considered by the project. The main risks could be: fire, weak law enforcement, weak institutional capacity to implement REDD+ project. Regarding risk of fire, the most common happening of it is in the Erica vegetation zone of the Bale Mountains, which is mainly located outside the project boundary. Fire sometime escapes to affect the forests in the REDD+ project boundary causing mostly insignificant extent of damage. These risks were considered by the project proponents and the mitigation strategies of the risks are also designed (see Table 5 below).

Table 5: Potential project risks and mitigation strategies

Potential risks	Mitigation strategies	Responsibility
Fire	- Forest fire brigade established in each JFM CBO structure; - Fire fighting equipment /tools made available for each JFM CBOs; - Capacity building of the forest fire brigade; - Construction of forest fire observation tower (steel); - Establish linkage with international fire Brigades (E.g. South Africa, Germany, etc) in case of big fires.	OFWE, JFM CBO, Farm Africa, SOS Sahel Ethiopia,, Woreda/Zonal/Regional Administration, Bureau of Agriculture
Weak law enforcement	- Oromia regional government has given attention to forest protection law enforcement, to stop illegal activities inside the forest; - The Climate Resilient Green Strategy (CRGE) and the Growth & Transformation plan of Ethiopia has given due attention to forestry sector (REDD+ is one of the four fast track implementation activities of the Ethiopian CRGE Strategy); - JFM CBOs (local community organization) are given mandate to locally enforce their internal bylaw to protect forest; - The project shall establish close working relationships with judiciary to enforce law.	OFWE, Oromia Regional government, Federal government, local/ woreda government, Forest management cooperatives
institutional capacity to implement REDD+ project	- Frequent training in the areas of REDD+ project implementation provided and will be provided to the OFWE staffs and the local communities; - REDD+ unit established in OFWE HQ and in the Bale and Arsi branches; - Federal level REDD+ secretariat established to provide support to regions for the implementation of REDD+ pilot projects - Farm Africa and SOS sahel Ethiopia with comprehensive experience in the forest carbon will backstop implementation of the project.	Farm Africa, SOS sahel Ethiopia, OFWE, Ministry of Environmental Protection and Forestry (MoEPF),

2.4 Measures to Maintain High Conservation Values (B1)

Special attention will be given to HCV areas specific to meeting community needs, including areas with *Coffee (coffea Arabica)* which is naturally growing in the Bale Mountains Natural forest and contributes a lot to the household economy in the area. The project supports the local community owning the wild coffee in the BMERP area to sustainably use the coffee for their livelihood improvement. There are also numerous natural mineral water springs, locally called *horas*, which provide an essential source of minerals for livestock. The mineral springs within the BMERP area are valued for their high mineral content (sodium, magnesium, zinc and calcium), and local pastoralists believe that in order to maintain good health and milk production their livestock must be given *hora* water..

The implementation of REDD+ project by nature is in favour of biodiversity conservation. The project implementation will focus on community participation in the conservation and monitoring of the forest through participatory forest management approach. Implementation of sustainable forest management contributes to maintain all the HCV of the eco-region (see section 1.3). Measures that are and will be taken to maintain the HCVs include identifying forest areas for different uses and priorities for conservation, implementing standardized management plan through the community (Participatory Forest managing cooperatives established in the area –see sample forest management plan), plus the planned project activities that intend

to reduce drivers of deforestation and forest degradation (section 2.2) Planned project activities comprise interventions like establishing woodlots for construction and fuelwood supply, promoting agro-forestry outside of the forest areas to produce non-timber forest products, implementing sustainable NTFPs (coffee, honey, medicinal plants, bamboo, etc) production practices, improving agricultural management to intensify production and reduce horizontal expansion, distribution of fuel efficient stoves to reduce volume of wood demand and the like (see section 2.2, table 4). For instance, a standardized management practices for forest coffee production in Bale and major coffee forests of Ethiopia have already been developed. The national NTFPs strategy of Ethiopia is also under preparation. The project activity has given special attention to address drivers that can severely affect biodiversity of the forest such as forest fire control through training and material supports to local communities (Fire fighting devices worth 0.4 mil USD have been distributed to communities involved in the project implementation (See also workers safety training plan supplementary material 30b).

Culturally, the forest is highly valued among the Oromo community. In oral Oromo history, part of the Bale Eco-region (Mada Walabu) is considered as the place of origin for all Oromo people, the biggest ethnic group in East Africa, perhaps the second largest in the whole of Africa. In Oromo tradition, trees and forests have high value, as economic as well as cultural and ritual sites. For instance large trees like *Ficus* are used as assembly places as well as ritual sites. Forests are the main sources of coffee, honey, traditional veterinary and human medicine, and seasonal grazing lands for lowland pastoralists.

Forests also provide watershed protection services highly valued and defended by pastoralists and agro-pastoralists from the lowlands. The local communities have strong traditional practices of managing forests and other communal resources. The project shall integrate these social, economic and cultural values and institutional arrangements such as PFM in its sustainable forest management endeavours.

These activities help ensuring that local biodiversity is protected and that their ecosystems are not fragmented.

2.5 Project Financing (G1.12)

The project finances come mainly from three sources: the first is the financial source to be generated from the trading on voluntary market of ER of 37 million tons of CO₂e GHG by the end of the project, i.e. 2031, second from the revenue generated from sustainable management and forest based (mainly NTFPs) business development in which some share is reserved as forest fund, and third from OFWE's annual budget allocation to the management of Bale Mountains Forest. These sources will ensure financial sustainability for the project.

As indicated in the BMERP fund flow structure in figure 15 above, the money generated from the carbon credit, part of which required to execute project activities indicated in table 5 above will be effectively transferred to the project site and those will be implemented according to the set schedule. More specifically, OFWE will be in charge for the implementation of project activities and all the funds required for these project activities will be channelled to the project site OFWE's branches effectively through the existing fund transfer system of OFWE as this has been ongoing already as part of OFWE's organizational operation system.

Furthermore, the BMERP has been developed with the financial support of grants² secured by Farm Africa/SOS Sahel, and the on-going support of OFWE. These have already covered considerable part of the early investments before carbon credits are verified and sold.

OFWE, the proponent of the project, is a public enterprise with the average annual revenue of 180795518 Eth Birr (10 million US\$) during the past six years and capital of 1.5 Billion Eth Birr (83 Million US\$). The annual expenditure during the same time period for the enterprise has been 39 Million Eth Birr or (2.1 Million US\$). OFWE's annual gross revenue has been growing over years as shown in the figure below (Figure 16). OFWE owns the concession of all forest plantations and natural forests within Oromia Regional State. Its income is growing over the years. Over the past six years for instance its income has grown by more than 65% mainly from the sustainable harvest of plantation forests within its concession. OFWE is governed by a board chaired by the regional Vice President. The organization has strong finance and administration wing

² Grants have been provided by Royal Norway Embassy, Royal Netherlands Embassy and Irish Aid offices in Addis Abeba, Ethiopia.

fully capacitated. Furthermore, it conducts external audit each and every year to make sure its financial system is healthy and free of any corruption. Besides, OFWE has the policy of zero tolerance to corruption and has an anti-corruption unit that independently check and control the way it manages its operation and financial resources.

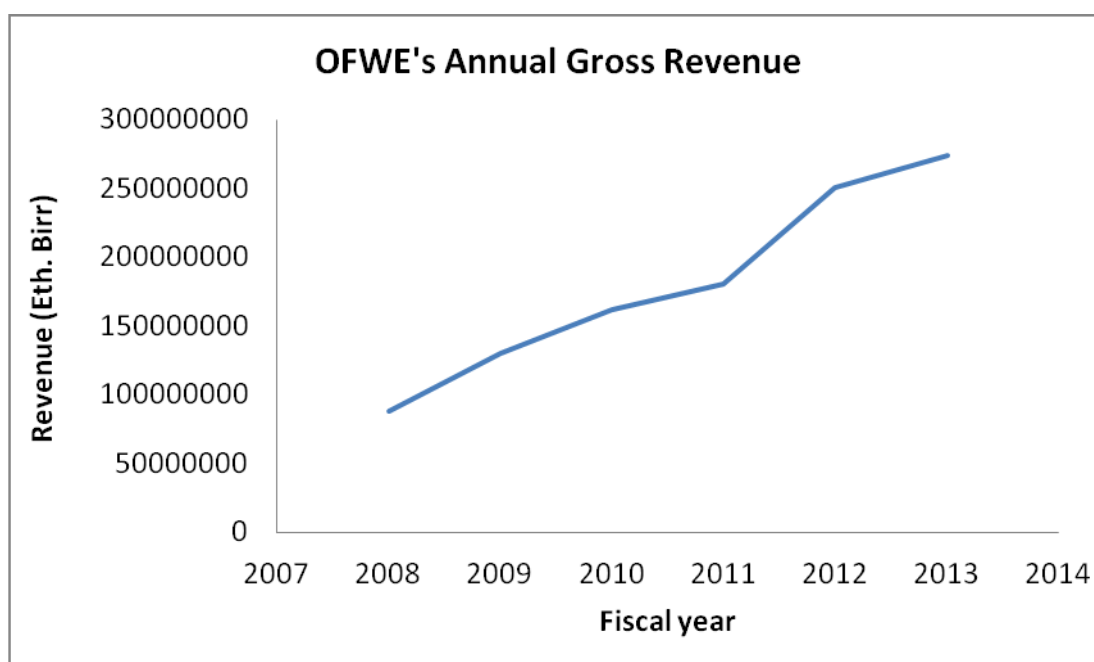


Figure 16. Growing trend of OFWE's annual gross revenue during the past six fiscal years demonstrating its financial viability.

OFWE is also currently on the process of developing state wide REDD+ programme, which is an additional income for OFWE operations. The Royal Government of Norway has committed itself to support such an initiative through the Bio Carbon Fund (BioCF) of the World Bank.

2.6 Employment Opportunities and Worker Safety (G3.10,G3.12)

Workers' safety capacity-building plan has been prepared for the government agencies and community institutions directly involved with the BMERP activities implementation (Supplementary material 30b). The capacity building activities include awareness creation about the general climate change & its impact on local community, role of forest in mitigating climate change, what the BMERP is doing, how the implementation of the project is carried out, any risk associated with the project implementation and safety requirements. During the FPIC process, OFWE has conducted comprehensive trainings and discussions with different community groups. During the discussion with the local forest dweller communities, it was explained that all the community members will be given equal job opportunity. The election of their representatives and leaders were conducted democratically by all the community members in each kebele.

The Ethiopian Labour system complies, among others, with the rules defined by Proclamation No. 377/2003 entitled "Labour Proclamation" (Supplementary material 30a). This is the main legislative standard for the Ethiopian labour law and ensuring that worker-employer relations are governed by the basic principles of rights and obligations with a view to enabling workers and employers to maintain industrial peace and work in the spirit of harmony and cooperation towards the all-round development of their country. The proponent of this project is OFWE which is strictly governed by the Labour Laws of Ethiopia. As per the law and workers' safety requirement, a number of equipments have been purchased, distributed and being used by those concerned (Supplementary material 30b),

In the case of BMERP, the hiring of the local people and OFWE personnel will be prioritized to carry out the functions envisaged by the project. At initial stages, hiring will be carried out by contracts directly between the Project Management and those hired, according to the form appropriate for the function and in accordance with Ethiopian law. Where appropriate, the hiring process will be done by the PFM cooperatives

or other implementing partners. In all cases, those contracted to work will be informed of their rights at the time of hiring.

The project is co-implemented by local community living with the forest and the public enterprise which is very aware and capable of implementing the labour law of the country. Therefore, the enterprise is there supports the local communities to fully understand and comply with their rights and obligations.

The Ethiopian labour law under its section three subtitle 12 also clearly indicted the safety issues of the worker. Accordingly, it is the obligation of the employer to take all the necessary occupational safety and health measures and to abide by the standards and directives to be given by the appropriate authorities in respect of these measures (Ethiopian Labour law: proclamation No. 377/2003).

2.7 Stakeholders (G3)

The BMERP has multiple stakeholders from Federal to local grassroots level. At the federal level the Ministry of Agriculture (MoA), Ministry of Environment and Forests (MEF) and the national REDD secretariat housed in the ministry including its various committees at national and regional levels. As a pioneering REDD+ initiative in Ethiopia, Bale REDD+ has been discussed widely at national scale attracting the interests, partnership and support of the government and development partners alike. At the regional state level the project has the support and approval from the Regional State of Oromia where the project is located.

The local communities in the BMERP area, some of them have already been organized in to Joint Forest management (JFM) cooperatives and got legal certificate. Others are under process of being organized. The cooperatives have internal bylaws through which all members are governed. The bylaws are formally recognized by government administrative and judiciary system. They have CBO governance structure (Figure 17) based on the Ethiopian government cooperative establishment and governance policy.

• JFM Cooperative Governance structure

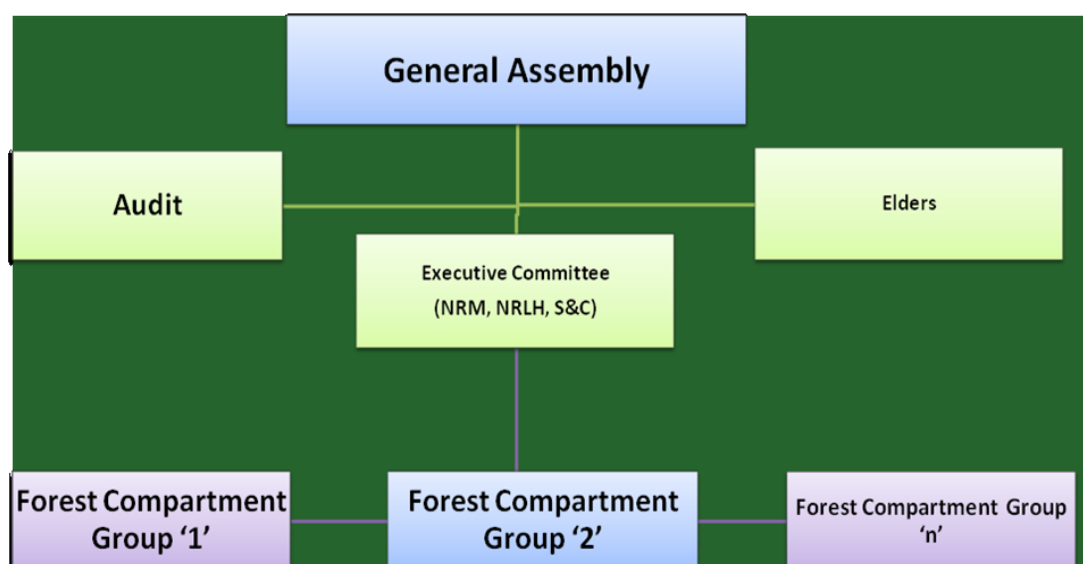


Figure17. JFM Cooperative Governance structure

The identification process of the local communities such as smallholder farmers, pastoralists, and non-timber forest product harvesters were done during the establishment of the Joint forest management (JFM) establishment system. During the establishment of the JFM, one of the critical requirements was stakeholder analysis using PRA tools to identify those stakeholders for the sustainable management and use of the forest jointly with government body responsible for the management of the forest.

The community JFM cooperative members have been jointly conserving the Bale Mountains forests jointly with government body with which they signed legally binding forest management agreement. In the agreement document the roles, responsibilities, rights and revenues of each agreeing parties were detailed. Based on the agreement, the local communities were benefited from the timber sale / income.

During the JFM establishment processes, the local communities were involved from the beginning planning to implementation of the forest management plan implementation. The system allows the local communities to own the forest and benefit from it. Based on the JFM experience, the BMERP was used the experiences and lessons to design the REDD+ project where the local communities were involved from the planning stage of the project.

The participation and commitment of the local communities in the project area/s was agreed through a process of "free, prior and informed consent," prepared and led by Farm Africa/SOS Sahel Ethiopia (Figure 18, pictures taken during FPIC process). The process involved over 62 meetings to explain the project objectives, the proposed construction of participatory baseline, the Investment Plan, etc. The risks were reported and discussed beforehand, clear and transparent dialogue between local communities and project proponents

During the BMERP development Free, Prior, and Informed Consent (FPIC) was conducted to secure the local community consent for the proposed REDD+ project. To conduct the local community consultation, the project trained community level development facilitators on the FPIC process. The trainings were on the following topics:

- Basic concepts and principles of Free, Prior and Informed Consent
- Why is Free, Prior Informed Consent Important
- Elements of Free, Prior and Informed Consent
- What and How to clearly explain FPIC to local community

After the community facilitator training, wider community awareness creation was conducted. Local community level FPIC was conducted in all the areas affected by the proposed REDD+ project. During the FPIC process, the following information regarding the project was clearly explained to the community members.

- Nature, size, pace, reversibility and scope of any proposed project or activity;
- Reason/s or purpose of the project and/or activity;
- Duration of the above;
- Locality of areas that will be affected;
- Preliminary assessment of the likely economic, social, cultural and environmental impact, including potential risks and fair and equitable benefit sharing in a context that respects the precautionary principle;
- Personnel likely to be involved in the execution of the proposed project (including indigenous peoples, private sector staff, research institutions, government employees, and others); and
- Procedures that the project may entail.

The consent documents attests that the Bale Mountains communities had access to all necessary information on payments for environmental services, especially on carbon credits, allowing them to take an informed position on the conduct of this process, evaluating the risks and benefits that implementing sustainable development actions can pose to their way of life.



Figure 18. Some pictures showing community

ies' consultation and participation in Bale REDD+ project design process (left photo = women group consultation; Right photo men group consultation)

Public comments:

- The development of Bale REDD+ project has been actively communicated to national stakeholders through national media (TV and radio) even before the PDD is officially posted on CCBA website.
- Following the posting of the English version of the Bale REDD+ project on CCB webpage, a number of actions were taken to provide local communities and stakeholders the opportunity to provide public comments. These actions include:
 - o E-mail communication to national stakeholders including the national REDD+ secretariat;
 - o Posting of the PDD on Farm Africa website and inviting all visitors to provide their comments on the PDD (Farm Africa website: <http://www.farmafrica.org/latest/news/post/667-farm-africa-moves-towards-accreditation-for-forest-carbon-scheme->;
 - o All Farm Africa staff e-mail was made to hold as part of its signature the posting of the PDD on VCS and CCB pages, and invited those individuals and institutions communicating with any of its staff to check and comment on the PDD. The signature reads as follow:
- *"With Farm Africa's support, the Ethiopian Government's REDD+ scheme in Bale Mountains is almost ready to start. This will generate revenues for communities protecting their forest resources. To learn more, and to have your say on how it will be implemented, please click [here](#)."*
- Communities in and around the project zone were also informed about the posting of the PDD on CCBA website through the project proponent staff using opportunities like public meetings, gatherings, cultural meetings and the like, were invited to provide any comments they might have to the project proponent offices in their respective districts;

Conflict/grievances redress mechanism G3.8)

The BMERP involves mainly community and OFWE (government) as project implementing parties. The community comprises both those organized as forest managing cooperatives, and those who are not members of the cooperatives, but having a traditional user rights over the forest. OFWE on the other hand comprises its structure at local and regional level. The success of the BMERP depends on the ability of these stakeholders to effectively and amicably resolve any problems and issues that arise during implementation of the project.

For this, the project has developed a procedure on how to address, and resolve complaints and grievances, discussed the same procedure among the parties and endorsed it (Supplementary material 31). Furthermore, the structure for the grievance addressing mechanism is deliberately integrated into the structure of the JFM/PFM cooperatives, by having a traditional conflict resolving elders committee in dealing with first level conflicts at each cooperative level. It has been discussed and agreed that as much as possible conflicts should be transparently, and quickly be managed and/or resolved through this traditionally well accepted procedure. It has been emphasized that the committee should be available to hearing of complaints and providing a platform for discussion and resolving of the conflict within a month time period. Project stakeholders can raise complaints and grievances to the elderly committee or its member either verbally or in writing. However, resolution reached, whether resolved or not, should be communicated to the parties involved in writing. The elderly committee is made aware the requirement for keeping records of every complaint and keep track of the status. In case conflicts could not be resolved at the level of the elderly committee, subsequent procedure for grievance resolution will follow the formal judiciary procedure of the country moving from district level courts to subsequent higher level as long as the grievance remains unsolved.

2.8 Commercially Sensitive Information

Two manuscripts for publishing in peer review journals are being prepared. These include a paper based on the Deforestation Modelling Report and a 2nd paper based on the Forest Carbon Inventory. These two documents should not be made publicly available until peer reviewed publication is achieved. When the manuscripts are published, the authors will communicate with the CCBA and VCS and make them available.

3 LEGAL STATUS

3.1 Compliance with Laws, Statutes, Property Rights and Other Regulatory Frameworks (G5)

Ethiopia is a federal parliamentary republic, whereby the Prime Minister is the head of government with executive powers. Federal legislative power is vested in both the government and the two chambers of parliament. The federal government oversees 9 ethnically-based regions and 2 chartered cities. The regions are further divided into 68 zones, which are in turn divided into districts (woredas). The districts are made up of neighbourhood associations (kebele).

The 1995 Constitution of the Federal Democratic Republic of Ethiopia empowers community through stressing the right of people of the country to participate in any development activities in their vicinity (Additional material-other relevant laws¹), and assigns extensive power to the regions that can establish their own government and carry out functions of government through an executive committee and regional sectoral bureaus. This structure of council, executive, and sectoral public institutions is replicated to the next administrative level of district/woreda.

In Ethiopia the ownership of land and other natural resources is vested in the people and the State (Additional material-other relevant laws¹). This is based on the 1995 Constitution of the Federal Democratic Republic of Ethiopia. Article 40(3) of the Constitution which provides that:

“The right to ownership of rural and urban land, as well as of all natural resources, is exclusively vested in the State and in the peoples of Ethiopia. Land is a common property of the Nations, Nationalities and Peoples of Ethiopia and shall not be subject to sale or to other means of exchange.”

There are different ways to interpret this ownership by the State and the peoples of Ethiopia. The best interpretation is that the Constitution has considered State and people as two distinct entities. Land is the joint property of these two entities, but the State administers land on behalf of the people. This is supported by Article 40(6) of the Constitution that indicates the State administers the land on behalf of the people:

“Without prejudice to the right of Ethiopian Nations, Nationalities, and Peoples to the ownership of land, government shall ensure the right of private investors to the use of land on the basis of payment arrangements established by law. Particulars shall be determined by law.”

A number of laws have been enacted that further confirm the State’s ownership of all lands in Ethiopia. The most relevant is the Federal Rural Land Administration and Land Use Proclamations Proclamation № 456/2005 which indicates that the Ethiopian government is the owner of all rural lands. Rural lands also include forests (Additional material-other relevant laws³).

The right to use land can be transferred by the State to individual users, communities, and others. The right to use land and other natural resources can also be separated. Forests (trees) are considered natural resources which can be sold independently from the land. All natural forests are considered to be government owned, but they can also be owned by communities when the government transfers a forest to them. Plantations are government owned when planted by the government and community owned when planted by the community on land transferred to them by the government.

Land use rights can be transferred to communities by government agencies pursuant to legislation. This could be via issuance of land holding certificates, concessions, or other agreements made pursuant to the relevant law. Once the land use right is transferred to the respective users, they can receive a landholding certificate. This landholding certificate may award the lifelong tenure for individual users, though the certificate does not offer complete protection against the government taking back the land use rights in the future. An exception to the lifelong tenure rule applies to communal landholders, for which no time limit is indicated in the landholding certificate. The time limit may be determined by the contractual agreement between the government and the community.

Land use rights are wide, but fall short of a right to sell the land. For instance, users can sell or bequeath property they have produced from the land by their labour or capital. These rights can be exercised by all rural land users including communal land users.

According to the Constitution, not only the State but also Nations, Nationalities and Peoples of the country (which include the local/traditional people of the country) have rights over land and forests. Local communities, especially pastoralists and forest dwellers usually own land/forests communally when assigned to them by the State and these rights are recognized by the Ethiopian Constitution. This constitutional right is confirmed by subordinated laws. In addition to land rights at individual level, communities will have group rights over land/forests when this has been granted by the government by a special agreement.

The primary law relating to the rights of workers or laborers in Ethiopia is the country's Labor Law (supplementary material 30a). OFWE, the project proponent, being a public institute is also governed by this law. Therefore, it is committed to provide this labour law, other civil codes, staff charters and any pertinent documents at hiring of staff to work in the project. The proponent has already started providing these to those currently working in the project.

Other laws and policies relevant for the project include the federal forest proclamation (Additional material-other relevant laws4) and the Oromia Forest proclamation (Additional material-other relevant laws2), and that of cooperative commission establishment proclamation (Additional material-other relevant laws6). These laws and policies re-enforce government's ownership of land and other natural resources, while ensuring the right of legally organized communities to jointly manage and use natural resources by entering into formal agreement, as is the case with PFM, with federal or regional government.

3.2 Evidence of Right of Use (G5.8)

All land is state owned in Ethiopia. Rural households obtain usufruct right over land for farming. Similarly all natural forests are State property. However, communities that live in and nearby the forests are entitled to use the forest for household purposes. Additional uses particularly commercial uses of forests can be arranged under special management agreement such as through Joint Forest Management Agreement (JFMA) signed between communities and the government's forest agencies. This arrangement has already been granted for the Bale eco-region communities. Through this arrangement the management responsibility as well as use rights of the forests under OFWE's concession has been formally transferred to organized community groups under the JFMAs. This arrangement is discussed in more detail below. We are not aware of any timber or mining concessions within the project area.

Joint Forest Management Agreements (JFMAs): A series of JFMAs were executed between the co-operatives and the Bale Forest Enterprise and the Arsi Forest Enterprises. These forest enterprises were initially established in 2007 as financially independent business organisations. However their constitutive acts were repealed and the enterprises were subsumed within OFWE and converted into the Bale Branch and Arsi Branch enterprises. These JFMAs are in the process of being formally assigned to BEB and AEB.

The same template JFMA is used for each contract between the enterprise branches and the cooperative, with only minor modifications between the contracts for local circumstances. The JFMAs set out the rights, benefits, and responsibilities of the cooperatives and the relevant forest enterprise. Under the JFMAs the cooperatives enjoy the following benefits:

- Recognition of the right to live in the forest (if they are currently doing so).
- Sustainable utilization of forest resources based on the forest management plan.
- A share of the benefits from ecosystem services (including carbon sequestration). This will be based on a Supplementary agreement that is not yet executed.
- Benefit sharing from plantation and natural forests.

The cooperatives also have a number of responsibilities including, inter alia, responsibilities to:

- Fully implement the joint Forest Management Plan.
- Produce and implement a Forest Management Action Plan annually.
- Ensure that destructive activities such as forest fires, clearance and settlement do not occur within the forest.
- Seek prosecution for individuals who destroy the forest.
- Prevent new house construction, coffee planting and agricultural expansion inside the forest.
- Ensure that the forest is able to naturally regenerate and that seedlings are planted when necessary.
- Protect the forest and seek legal redress from individuals, who without customary use rights, have utilised the resource without having entered into an agreement with the Cooperative.
- Ensure that beehive construction is not destructive and does not use endangered trees.

- Ensure that all fires are controlled and managed when used in the forest for cooking, burning crop residues, smoking beehives etc.

The enterprise branches have the following responsibilities under the JFMAs:

- Build the capacity or provide technical assistance to the cooperative in order to realize sustainable forest development, protection and utilization.
- Assist and monitor the implementation of the joint Forest Management Plan.
- Ensure that the rights of the cooperative are not violated by any individual, group or organization by supporting the cooperative in any way possible.
- Ensure that benefits from ecosystem services (including carbon sequestration, payments for environmental services, trophy hunting) is shared with cooperative based on a supplementary agreement being made between the two parties.

Benefit sharing agreements for the jointly managed forest is also cleared defined and as related to carbon credit is also negotiated. Through this negotiation, the CBOs are entitled to directly benefit from the sale of carbon credits as the joint owners of the forest. This is also required under Ethiopian law.

However, Ethiopia does not contain any specific legislation that defines what a carbon credit is under Ethiopian law, who owns them, or how they are transferred. However, carbon credits associated with land and forests such as those derived from REDD project can be associated with a forest and may also be considered a “forest product”. Forests and things derived from them are a natural resource which, under the constitution, is owned by the people and the Government. The State is responsible for administering all land and natural resources on behalf of the people. The prima facie administrator of carbon credits is therefore the State. The State can transfer rights to natural resources to individuals, communities or other groups of the society to use this right by way of payment of royalty or other means of payment.

The federal government has granted the power to administer state forests to the regional states under the Federal Proclamation 542/2007. This proclamation also dictates how CBOs obtain rights to forests:

“Private individuals, associations, governmental and non-governmental organizations and business organizations who want to develop forest shall have the right to obtain rural land in areas designated for forest development in accordance with regional land administration and utilization laws

OFWE is established by the Regional Government of Oromia to administer the forest under its concession. This includes all the forest within the project except for the Bale Mountains National Park. Given the inextricable link between forests and REDD carbon credits, OFWE is also responsible for administering any carbon credits associated with the forests it is responsible for. This extends to the sale of carbon credits and management of the proceeds of such sales. This is clearly supported by the regulation number 122/2009 provided for its establishment that indicates:

- OFWE was established with the recognition that “it is necessary to establish an independent structure that takes up the implementation of carbon trading
- One of OFWE’s objectives is to contribute to the mitigation of climate change by applying conservation, extensive development and sustainable utilization of existing forest resources.
- OFWE is responsible for managing the Forest Fund, including revenues from sales of carbon credits.
- OFWE has the power to “issue and implement directives relevant for the attainment of its objectives” and “perform all other duties necessary for the attainment of its objectives”.

Confirmation of OFWE’s rights to the carbon credits is also being sought from the federal Environmental Protection Authority via a letter of no objection.

While the JFMAs acknowledge use rights and rights to sharing the benefits of carbon sequestration, they do not state that control or administration of carbon credits has also been assigned to the CBOs. However, to avoid possible claims of ownership over carbon credits was implicitly transferred under the JFMAs along with control of the forest, future JFMAs will contain more explicit language that positively affirms ownership of carbon credits is not transferred to the CBOs. As the CBOs are responsible for managing the forest to generate the carbon credits, benefits from the sale of the credits will be shared with the CBOs. Future JMAS will therefore contain a new clause titled “Limitation of rights and responsibilities”. This will be subject to negotiation, but is expected to include language based on the following:

“Rights granted to the Cooperative under this agreement do not include rights to own or sell emission reduction or carbon sequestration credits. Any rights to such credits are retained by OFWE who shall be

responsible for selling any such credits associated with land or forest subject to this agreement. This does not in any way affect the rights of the Cooperative under Article 5.1.c to a share of the profits from such sale of credits.”

The benefit sharing agreements that have been negotiated with the JFMAs and communities contain similar language to cover any such claims under the existing JFMAs.

Legal Opinion: Ethiopian counsel has prepared a standalone legal opinion regarding ownership of carbon credits from the project under Ethiopian law. This opinion reflects the findings presented in this report.

3.3 Emissions Trading Programs and Other Binding Limits (CL2)

The BMERP does not reduce GHG emissions under an emissions trading scheme, to meet binding limits or similar

3.4 Participation under Other GHG Programs (CL2)

The BMERP analyzed all possible scenarios that would result in future REDD+ regulations and the project is being developed in a way to integrate and comply with possible future national and international regulatory regimes. The project has not been registered and is not seeking registration under any other GHG programs. If there will be any, the project proponent provide the details. The credits generated by the project will be under the VCS registry system.

3.5 Other Forms of Environmental Credit (CL2)

Not applicable.

3.6 Projects Rejected by Other GHG Programs (CL2)

Not applicable.

3.7 Respect for Rights and No Involuntary Relocation (G5)

The Oromia Regional State through OFWE has already entered into legal contract (agreement) with the local community for indefinite period of time to jointly manage and benefit from the forests through the new form of management arrangement called Joint Forest Management (JFM). This JFM agreement clearly stipulated rights and obligations of each part. As part of the rights granted to the community they obtained a legal respect of continue living in and around the forest in harmony with the forest while managing it for sustainability and continue benefit from it including their traditional use of it as well as from the carbon credit to come. Through this agreement the community has gained a confirmation that they will not be subject to any involuntary relocations. Furthermore, the very principle of JFM is to ensure a co-existence between the community and the forest by fully engaging local communities in decision making over their forests, participate fully in its management in partnership with government and share benefit from any commercial use of it while enjoying traditional use rights.

By gaining rights over the forest through the signed forest management agreement, the community area also granted carbon right; hence share of carbon credit related benefits. This has been confirmed during the extensive consultation and participation activities conducted throughout the project site. Furthermore, the project has conducted an important process of free, prior and informed consent (FPIC) with the communities, discussing with them, consultation and participating them in planning activities related to the REDD+, identifying and assessing potential impacts, risks and benefits, as well as listening to their concerns, suggestions and needs. In fact, the consultation process for the Bale REDD+ project was conducted for different stakeholders at different levels: Federal, Regional, Zone and woreda government levels and at local community levels. The government level consultation was conducted in Addis with the presence of federal and regional government stakeholders in Global Hotel and the zone level was conducted in Bale Zone for Bale and West Arsi stakeholders, whereas grassroots level consultation and participations were conducted in each village where the communities are located. Summary of the consultation and participation activities conducted include:

During the FPIC process the following processes and activities have been accomplished:

- Training workshop was given to government and relevant partners at regional and federal scale
- Training was given to local governments (represented by different departments) in Bale (37 represented)
- Training was arranged at local grass roots level training for development agents(DAs) (69 participated), and
- Awareness creation meetings and consultations conducted on FPIC among the communities in the eco-region covering all affected areas around and in the project area

Various techniques of consultation were employed such as group discussions, meetings, workshop and informal and formal discussions with individuals.

The FPIC process was started in 2011 where initial consensus was reached with the positive community consent, however the formal consent was given by signing in 2013. The critical issue is that the communities directly affected by the project are part of the BMERP

Consultation and participation of the community and obtaining their consent

BMERP has fully engaged and consulted local community in the process of the project development. More specifically as a social safeguard strategy of the project, Free, Prior and Informed Consent (FPIC) has been conducted in the project area. It was conducted in 62 kebeles of the Bale eco-region where local communities living around the project area were participated during the FPIC processes. During the process the nature of the project, locality that will be affected, the likely benefit of the project, the benefit sharing modalities were discussed and negotiated with the community.

The FPIC process was conducted as a process of establishing conditions under which people exercise their fundamental rights to negotiate the terms of externally imposed policies, programs, and activities that directly affect their livelihoods or well-being, and to give or withhold their consent to them.

The right to FPIC can therefore be viewed as an additional component to any effective, on-going consultation process, or as an extension to sound community engagement strategies. The more participatory the process of change is, the less emphasis and time is needed to secure 'consent', as communities will have already actively defined the processes and outcomes of any proposed change.

The key elements of the FPIC process used in the case of BMER were understood as described below:

- **Free:** implies no coercion, intimidation or manipulation;
- **Prior:** implies consent has been sought sufficiently in advance of any authorization or commencement of activities and respect of time requirements of indigenous consultation/ consensus processes;
- **Informed:** implies that information is provided that covers (at least) the following aspects:
 - Nature, size, pace, reversibility and scope of any proposed project or activity;
 - Reason/s or purpose of the project and/or activity;
 - Duration of the above;
 - Locality of areas that will be affected;
 - Preliminary assessment of the likely economic, social, cultural and environmental impact, including potential risks and fair and equitable benefit sharing in a context that respects the precautionary principle;
 - Personnel likely to be involved in the execution of the proposed project (including indigenous peoples, private sector staff, research institutions, government employees, and others); and
 - Procedures that the project may entail.
- **Consent:** -Consultation and participation are crucial components of a consent process. Consultation should be undertaken in good faith. The parties should establish a dialogue allowing them to find appropriate solutions in an atmosphere of mutual respect in good faith, and full and equitable participation. Consultation requires time and an effective system for communicating among interest holders. Indigenous/local peoples should be able to participate through their own freely chosen representatives and customary or other institutions. The inclusion of a gender perspective and the

participation of indigenous women are essential, as well as participation of children and youth as appropriate. This process may include the option of withholding consent. Consent to any agreement should be interpreted as indigenous peoples having reasonably understood it.

Community level FPIC work has been conducted in all the REDD+ project kebeles. The FPIC process was conducted smoothly due to the fact that the programme and the partners promoting the Bale REDD+ project have been working closely with the community already for some time establishing JFM arrangement during which trust has been built. During the FPIC planning phase, facilitators were selected from the locality, and trained on core principles of FPIC, what it is and their roles as facilitators. After the training the facilitators were sent back to kebele/community where they were assigned to conduct the FPIC process with their respective community members. The facilitators conducted awareness raising work on BMERP project for the wider community through kebele level meetings. The kebele level meetings (see examples in Figure 17 below) resulted in nomination and appointment of five individual as a REDD+ planning committee for each kebele to represent the local forest management cooperatives and wider community (non-JFM cooperative members) from their respective kebeles in the FPIC process (Table 6). The committee members were mandated with planning and implementation of FPIC with the consent of kebele community they represent.

Table 6. Data on kebele level community meeting participants for Bale REDD+ trainings

Woreda	Cluster	Number of kebeles	Number of community members attended the meeting			Remark
			Male	Female	Total	
Nensebo	Adaba-Dodola	12	2047	151	2198	
Kokosa	Adaba-Dodola	2	221	27	248	
Dodola	Adaba-Dodola	6	1283	178	1461	
Adaba	Adaba-Dodola	3	314	17	331	
Mede Wolabu	Mena-Angetu	1	0	0	0	
Delo Mena	Mena-Angetu	7	1	2	1	
			7	0	9	
			3	0	2	
			4		4	
Harena Buluk	Mena-Angetu	8	2917	1130	4047	
Gololcha	Kubayu	6	349	101	450	
Berberere	Goro-Bele	10	543	205	748	in 4 kebeles.
Goba	Aloshe-Batu	3	114	277	391	
Agarfa	Aloshe-Batu	3	168	11	179	
Total		61	9690	2297	11977	

The Bale REDD+ piloting project provided week long training to the community representatives in August, 2013. The training covered the following topics: climate change and forest, introduction to REDD+, the role of forestry in combating climate change and FPIC principles and its importance, and the right of the community.

After the training FPIC plans were prepared incorporating decision making processes, information and communication strategy, grievance handling mechanism, transparency and forest management plan, capacity building plan and benefit sharing topics, which was then taken back to their respective kebele community for comments.

During the kebele level consent seeking meetings, awareness creation on general climate change and detail explanations were given on the proposed Bale REDD+ project on what, how, where and when of the project. After the community understood the whole idea of the project, extensive discussion on the project contents and ideas were held among the community groups. During the meeting community questions and clarifications were properly handled and the communities were satisfied by the responses and explanations given.

The outcome of the wider community level discussion has revealed that the majority of the community has expressed their interest of acceptance of the project and willing to work with the project. As a witness for their willingness they have nominated five community representatives per kebele to sign the consent document on the wider community behalf. In some of the kebeles, high number of community members attended the meeting that makes the event very special in that it the first of its kind where such high number of community members attended a meeting (Figure 19a).



a)



b)

Figure 19. The FPIC process (a) showing sample of community meeting to discuss about the project; and (b) sample community representative signature for positive consent.

Table 7. Community & government staffs participated on FPIC training

Woreda	No of Kebele	Number of community participants			Experts		
		M	F	T	M	F	T
Meda Walabu	1	3	2	5	3		3
D/Mena	7	21	14	35	4		4
H/Buluk	8	24	16	40	4		4
Berbere	9	25	18	43	6		6
Goba	3	9	6	15	4		4
Agarfa	3	9	6	15	3		3
Gololcha	6	18	7	25	4		4
Nensebo	11	39	7	46			
Dodola	7	31	5	36	4		4
Kokosa	2	9	1	10	4		4
Adaba	3				3		3
Total	60	188	82	270	39		39

In all the project kebeles' community level FPIC discussion, the local community gave their consent positively and agreed to participate in the implementation and benefit sharing of REDD+ project. The community confirmed their support of the project though putting their signatures on the consent paper (see sample in figure 19b)

The FPIC process was a progressive process. In order to enhance community's understanding of the need for FPIC and risks and benefits of the project, a second round FPIC training was held in all 61 REDD+ project kebeles. A total of 1560 (956 M & 591 F) community member took part in this second round training. Topics covered in training were:

- Decision making institutions
- Resource management plan
- Communication plan
- grievance handling
- benefit sharing
- capacity building

Table 8. Participants of FPIC second round training

Woreda	Number of Participants		
	Male	Female	Total
Agarfa	69	8	77
Goba	40	35	75
Gololcha	117	44	161
Nensebo	148	142	290
Kokosa	43	7	50
Adaba	49	26	75
Dodola	149	23	172
Harena Buluk	109	103	212
Meda Welabu	16	9	25
Bebere	130	120	250
Delo Mena	99	74	173
Total	969	591	1560

Benefit sharing modalities negotiated: In addition to the extensive consultation and participation processes conducted with all project stakeholders benefit sharing discussion has been facilitated between the organized local communities (JFM CBOs) and OFWE (Government representative). Through their partnership in forest management as the result of JFM agreement both parties have already negotiated and agreed on benefit sharing arrangement for products extracted and traded from the forests in Bale. In

addition, both parties agreed to conduct additional negotiation on benefit related to the carbon credit from BMERP as the earlier agreement doesn't include such dimension. This negotiation has been facilitated by Farm Africa/SOS Sahel. The outcome of the negotiation has confirmed the lion share of the carbon credit to be channelled to the community for the purpose of community level social development works such as school, clinic and road infrastructure building to benefit the entire community as well as partly to incentivize communities that are directly engaged in the management of the forests. Part of the finance will also be used to address directly the drivers of deforestation through introduction, adoption and distribution of improved technologies by appropriate agents.

3.8 Illegal Activities and Project Benefits (G5.4)

The forests in the eco-region were exposed to a near open access situation due to lack of dedicated local institutions, weak government forest sector administration, poor law enforcement and lack of empowering and engaging local community in management as well as benefit sharing generated from forest products sales. As a result the forests have suffered from illegal timber harvest and sale as well as farmland encroachment. However, following the establishment of OFWE as a public enterprise with clear mandate and the modernized approach of OFWE to engage, empower and work in partnership with local communities PFM has been introduced that allowed the legal transfer of forest management responsibility and use right to community living in and around the forests. This model has proven effective in reducing deforestation significantly while also making forestry play considerable role in rural development and boosting household income. The same model is envisaged for the Bale eco-region where this REDD+ project will be implemented. PFM has already been started in the eco-region and will be expanded to cover all parts of the project area as part of the BMERP project activities. Moreover, as outlined in the project activities the capacity of the organized local communities and that of OFWE will further be strengthened to sustain the control of illegal practices. In addition there are federal and regional level anti-corruption and bribery laws that can re-enforce any illegal activities by any agents, while law enforcement agencies have already been well oriented and will further be well oriented to avoid any further illegal activities within the project boundaries.

Monitoring and evaluation protocol is designed for the project as well to track any problems encountered and to ensure timely avoidance of illegal activities.

Traditionally, communities used to own and manage forest resources. The Federal Constitution (1994) also declared that all land; including forests belong to the government and the people of Ethiopia. Regional states are mandated to manage land/forest within their administrative boundaries. The forest areas in Oromia Regional State are given to OFWE on concession basis so as to enhance forest development, conservation and sustainable utilisation of the same. The natural forests are primarily meant for conservation, so as to sustainably provide ecosystem services. Many forests areas, including the Bale Eco-region are co-managed by OFWE and the local community through Participatory Forest Management (PFM) regimes. In Bale, the PFM started as pilot in Adaba Dodola in 1999, and further expanded to the rest of the Eco-region since 2007.

The Federal Forest Proclamation (542/2007) states that forests shall be protected from fire, unauthorized settlement, deforestation, undertaking of mining and other similar activities. It also highlighted the need for community participation and sharing from the benefits of sustainable forest management. The proclamation states that:

“Conditions shall be facilitated whereby inhabitants within a state forest shall continue living in the forest, while participating in the development and conservation of the forest, in a manner that shall not obstruct forest development; or, based on a study and in consultation with the appropriate body, they shall evacuate the forest area and settle in other areas suitable for living”.

The proclamation stated that forests be managed and utilized only in accordance with approved management plans. It clearly prohibits activities such as: cutting trees, settling temporarily or permanently, grazing domestic animals, carrying out hunting activity, carrying cutting saws and any other tools used for cutting trees; and keeping beehives or extracting honey inside forests without seeking permissions from appropriate government authority.

Similarly, the Oromia Forest Proclamation (72/2003) also prohibits the following activities without appropriate permission: cut any trees, make charcoal, settle in the forests, keep domestic animals in the forest, hunt,

keep beehives or harvest honey, and take natural resources. The Oromia Forest Proclamation also specifically prohibited cutting and utilizing of some tree species from natural forests. These include: *Hagenia abyssinica*, *Cordia africana*, *Podocarpus falcatus*, *Prunus africanus*, and *Juniperus procera*.

Given these legal provisions and the projects' objectives of conserving carbon and biodiversity, it is illegal to generate project benefits from hunting, expansion of agriculture through deforestation, unplanned logging, harvesting threatened tree species, unregulated grazing of domestic animals in forests, fuel wood collection for sale, charcoal making, settlement, mining, and unsustainable harvesting of NTFPs products, including forest coffee, honey, bamboo and medicinal plants. Such economically important NTFPs should be harvested through sustainable management practices prescribed for the specific NTFP and in accordance with the forest management plan.

4 APPLICATION OF METHODOLOGY

4.1 Title and Reference of Methodology

4.1.1. Scope of the methodology:

The Bale REDD+ Project fits in category F of the methodology (vm0015 v1.1) (Figure 20 below). The baseline is defined by deforestation of degraded and still degrading forests; project activity is protection with controlled logging, fuel wood collection or charcoal production. In this category accounting for carbon stock increase in the project scenario is optional and can conservatively be omitted (Table 9 below). Our suggestion is that if the project can assure reduction in the fuel wood collection and other forest degradation activities (i.e. grazing of understory), then, it becomes possible to account for carbon stock increase. This will require a forest inventory survey at least every 10 years (but can be done within a shorter period if desired).

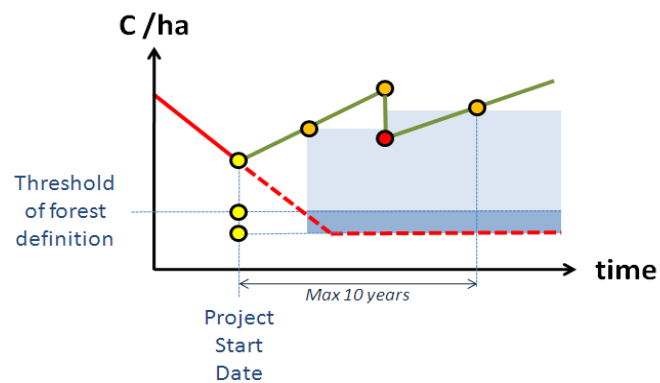
Table 9. Scope of the methodology (Table 1 vm0015, v1.1)

			Project activity	
			Protection without logging, fuelwood collection or charcoal production	Protection with logging, fuelwood collection or charcoal production
Baseline	Deforestation	Old growth without logging	A	B
		Old growth with logging	C ¹	D ¹
		Degraded and still degrading	E ¹	F ¹
		Secondary growing	G ¹	H ¹
	No-deforestation*	Old growth without logging	No change	Degradation
		Old growth with logging	IFM	IFM-IRL
		Degraded and still degrading	IFM	IFM
		Secondary growing	No change	Degradation

1. Accounting for carbon stock increase in the project scenario is optional and can conservatively be omitted

2. If the baseline is not deforestation the change in carbon stock is not covered in this methodology

**F - Avoided Deforestation of Degrading Forest
with Logging in the Project Case
+ Carbon Stock Increase (optional)**



Note: Avoided degradation occurring prior to deforestation is conservatively not claimed.

Notations

- Historical carbon stocks
- - - Projected carbon stocks (Baseline)
- Project scenario carbon stocks
- Emission reductions always claimed
- Emission reductions optionally claimed
- Mandatory *ex ante* measurements
- Optional *ex post* measurements (for optional emission reduction credits)
- Mandatory *ex post* measurements

Figure 20. Category F in the scope of the methodology (Figure 2, vm0015, v1.1)

4.1.2. Title of the methodology

The Bale Mountains Eco-region REDD+ project is designed to promote activities that reduce deforestation in the Bale Mountains eco-region. Therefore, it falls within the *Avoided Unplanned Deforestation and/or Degradation (AUDD)* VCS AFOLU category.

4.1.3. Reference of the methodology:

The reference of the methodology is VCS VM0015 v 1.1,

4.2 Applicability of Methodology

The BMERP fits with the applicability condition of the methodology based on VCS VM0015 v 1.1, which fits the conditions described above, has been adopted after assessing options using eight criteria points as shown in table 10.

Table 10. Screening for applicability of various VCS methodologies for the BMERP using eight criteria points.

	VM0006	VM0007	VM0009	VM0015
Scope	✓	✓	✓	✓
Baseline	✓**	✓	✓**	✓
Project boundaries	✓**	✓	✓	✓
Agents and drivers of deforestation	✓	✓	✓	✓
Activities in the project scenario	✓**	✓	X	✓
Leakage	✓	✓**	✓**	✓
Monitoring	✓	✓	✓	✓
Carbon stocks	✓	✓	✓	✓

(Note: “√” mark represents that such item has no application constraints. When the “√” mark is followed by asterisks (**) it means that the item has some constraints to be applicable to the Bale REDD Project, which are described below. The “X” mark means that the item is not applicable).

The BMERP meets the five applicability conditions of the VM0015, v1.1 methodology as follows:

- Baseline activities include unplanned agricultural and grazing activities, fuel wood collection, considered unplanned deforestation according to the most recent VCS AFOLU guidelines
- BMERP activity is classified as “ Protection with controlled logging, fuel wood collection” one of the eligible categories defined in the description of the scope of the methodology (see table 1 and figure 2 – scope of methodology);
- The project area includes mainly old-growth and degrading forests of moist and dry evergreen montane forests meeting the definition of “forest according to Ethiopia’s definition of forest – see footnote 1”.
- At project commencement, the project area includes only land qualifying as “forest” for a minimum of 10 years prior to the project start date. The project has confirmed this through satellite images based analysis starting from the year 2000.
- The project area does not included forested wetlands.

Thus, the project complies with the specifications of the chosen methodology and uses the four specified spatial domains: the reference region, the project area, leakage belt, and leakage management area, the latter three sub-regions of the reference region.

4.3 Methodology Deviations

Currently there are no known significant deviations from the approved methodology.

4.4 Project Boundary (G1.4)

Based on the methodology, VM0015, v1.1, the project defines four specified spatial domains namely the reference region (RR), the project area (PA), leakage belt (LB), and leakage management area (LMA). These different spatial boundaries constituting the project are unambiguously defined using KML, Vector and raster map files. All GIS map files are projected to UTM Zone 37N coordinate system with the datum WGS84, which are national map reference systems in Ethiopia. The descriptions and maps depicting each of the boundaries as related to the project are presented below:

Step 1: Definition of boundaries (based on the nine methodology steps for Ex-ante estimation of GHG):

1.1. Spatial boundaries

1.1.1. Reference Region (RR): At the time of preparation of this PDD, no national or sub-national baseline exist that meets VCS specific guidance on applicability of existing baselines, as specified in Table 2, VM0015 V 1.1. The BMERP is a pioneer initiative in Ethiopia as also indicated in the Government of Ethiopia's, R-PP submitted to the FCPF of the World Bank. The project proponent is committed to follow any sub-national or national policies and regulations, or VCS rules, regarding jurisdictional and nested baselines as they might emerge in the coming years.

However, for the sake of this project development, the RR is defined as the area within the Bale Mountains eco-region covering similar geo-physical characteristics to the project area and where agents, drivers, and overall patterns of deforestation represent a credible proxy for possible future deforestation patterns in the project area. This covers an area of 2.08 million ha (Figure 21), which is approximately 8 times the size of the Project Area and has a perimeter of 3,386 km. This region includes the project area (PA), leakage belt (LK) and leakage management area (LMA) and other geographic areas relevant to determine the baseline of the project area. It consists of dry and moist evergreen forests, shrubland (high elevation area Erica shrubland and afro-alpine grassland land covers) and extensive woodlands and agricultural land. In general, the RR has been chosen that exhibits the following characteristics:

Agents and drivers of deforestation:

Drivers and agents were assessed using a combination of methods that involved: interview with local communities and experts in the landscape and field observations. Interview process involved group discussion with communities, individual interview with experts from OFWE field staff (5 in total), Farm Africa/SOS Sahel field staff (5 in total), experts of bureau of agriculture (district level) (3 experts). The interview was guided by checklist of questions that focussed mainly on agents of deforestation and degradation in the landscape, drivers of deforestation and historical trend (time line analysis) and the like. The following presents the finds from the assessment:

I. Agents groups:

The primary agents of deforestation within the RR that are also expected to encroach into the PA in the future are rural communities that are subsistence farmers, cattle herders, wild honey tappers and gatherers of fuel wood and construction poles in the Bale Mountains Eco-Region forest area.

II. Drivers of deforestation and forest degradation:

Small scale farmland expansion: In Bale eco-region deforestation as a result of population increase that induces small holder farmland expansion is found to be major driver of deforestation (Alemu et al., 2012; Kidane et al., 2012; see additional materials folder for these documents). According to Kidane et al. (2012), the main drivers of deforestation in the Bale Mountains over the last 40 years belong to the following categories: rapid population growth and resettlement that induced agricultural expansion (small holders) and infrastructure development. The same study also identified temporal and spatial differences in the rate of deforestation across the eco-region, i.e. some areas are more deforested than others. Our project study also found a similar drivers and agents of deforestation in the Bale eco-region (supplementary material 29). The historical deforestation rates during the reference period (2000-2011) in the eco-region were 6.67% for the Dry Evergreen and 1.1% for the Moist Evergreen forests. The average deforestation for all the strata in the reference region was 2.6 %.

Infrastructure drivers: currently planned new or improvement of existing infrastructure is expected in the area near or inside the RR as well as in the PA.

Other spatial drivers expected to influence the project area: no other major agents and drivers of deforestation have been identified in the area (i.e. the RR and the PA).

- **Landscape configuration and ecological conditions:**

Forest/Vegetation class: the forests in the RR and the PA are similar types (100%) namely Dry and Moist Evergreen Afromontane forests.

Elevation: A total of 90% of the pixel of the PA (elevation between 1470 - 3013 m asl) is within the elevation range of the rest of the RR (1200 – 3450 m asl).

Slope: The average slope of 90% of the PA (11.5°) is within $\pm 10\%$ of the average slope of the rest of the RR (6.9° to 13.0°), and

Rainfall: the annual precipitation within the PA (600-1400mm) is the same as the RR.

Socioeconomic and cultural conditions

Legal status of the land: The constitution of Ethiopia clearly stipulates that land and natural resources including forests are the common property of the State and the people of Ethiopia. However, the forests in Bale Eco-Region have been given as a concession to a public enterprise called Oromia Forest and Wildlife Enterprise (OFWE) who is the proponent of this project (see Supplementary material 18). However, OFWE and the local communities have entered into a Joint Forest Management arrangement to co-manage the forests through shared roles, responsibilities and benefits, an arrangement that is not time bounded.

Land tenure: land tenure system in the project area in the baseline scenario is found throughout the reference region. The forest land within the reference region and the project area is under the concession of OFWE. Regarding farmlands local communities enjoy usufruct right for indefinite period of time including inheritance to their off-springs. Tenure security has been confirmed already in some of the area through land certification issued by the Regional Bureau of Land and Environmental protection. Furthermore, the JFM agreement signed between community and OFWE has granted both parties equal right of decision making on the management of the forest in the reference region and project area as well.

Enforced policies and regulations: Policies, legislations and regulations applicable to the forest protection and conservation are both national and Sub-national in scope and the project area as well as the reference region is governed by these laws. However, in the baseline scenario, these regulations are not strictly enforced and the reality in the entire reference region is similar to the project area. Consequently, the Bale Mountains Eco-region experienced the highest accumulated deforestation than any other parts of the country.

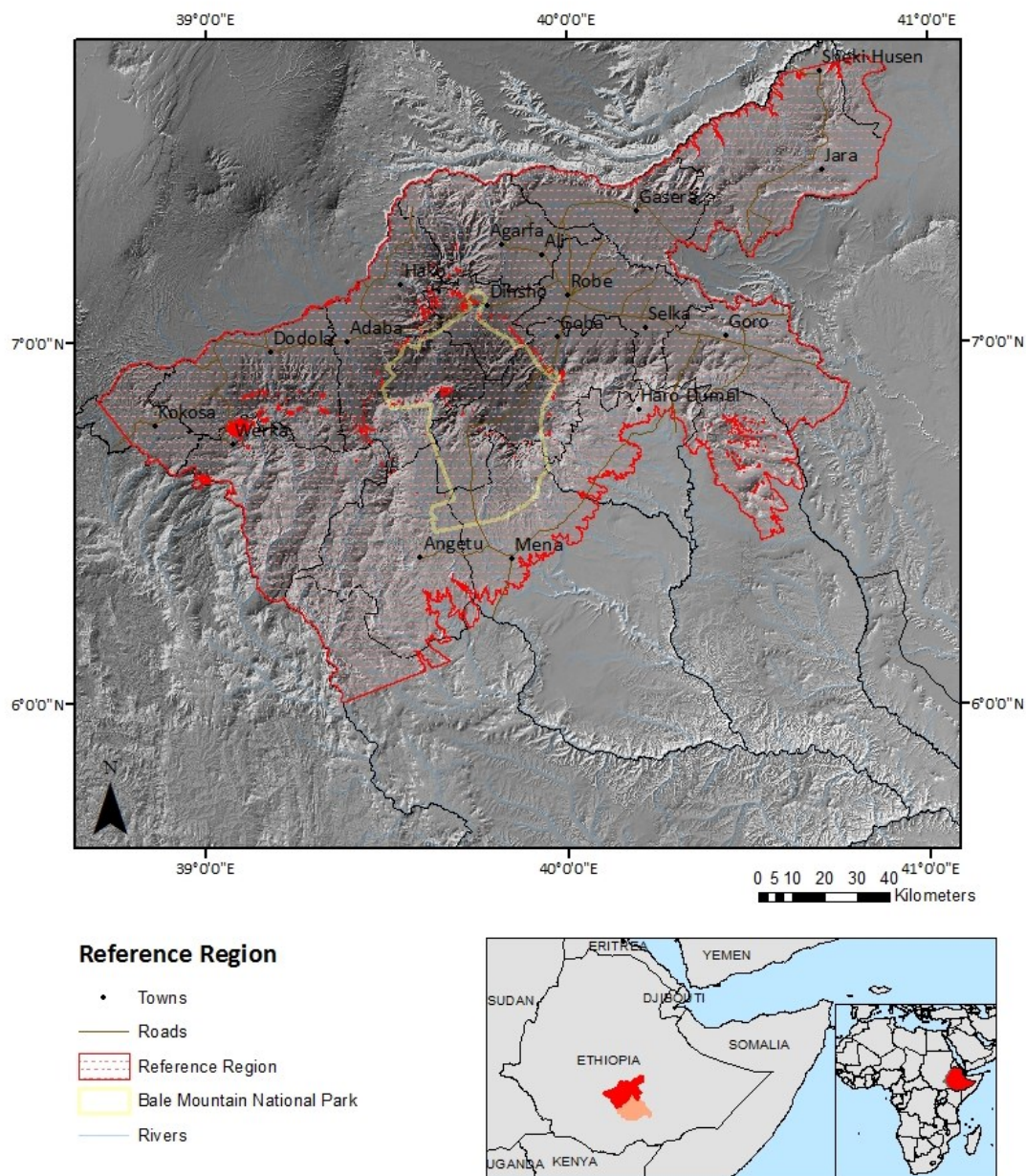


Figure 21: Map of Reference Region (RR) for Bale Mountain REDD+ project

1.1.2. Project Area (PA): comprises two major forest types: Moist Evergreen and relatively small continuous patches of dry evergreen forests. It has a total forest with an area of 261,053 ha, consisting of 238,200 ha of humid forest and 22,853 ha of dry evergreen forest. (Figure 22). The project area was chosen after the initial deforestation modelling analysis in the reference region was completed as well as gathering input from local experts regarding the key agents and drivers acting in each kebele (smallest administrative unit of the government structure)

It is found spread in 11 Woredas namely Kokosa, Dodola, Adaba, Agarfa, Nansabo, Harena-Buluk, Mena, Meda Welabu, Berbere, Goba and Gololcha.. The Moist Evergreen forest in the project area is known locally as Harena-Kokosa forest, while the Dry Evergreen forests are known as Adaba-Dodolla and Kubayu forests.

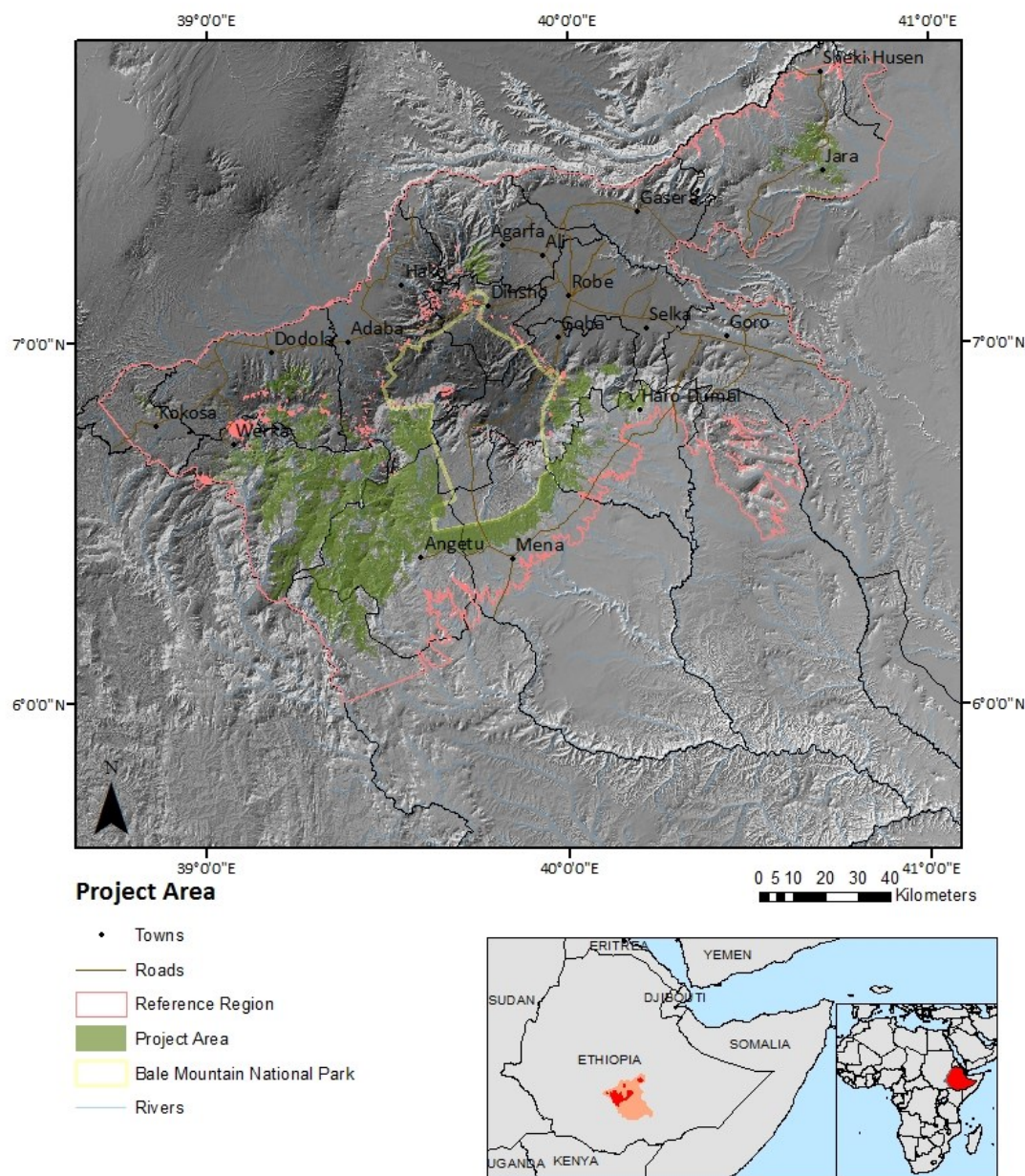


Figure 22. Map of Project Area (PA) for Bale Mountain REDD+ project

1.1.3. Leakage Belt: The leakage belt was defined using a mobility analysis option (step 1.1.3, VM0015, V1.1, option II). A detailed study of the historical mobility condition of the community in Bale eco-region was conducted (Anonymous, 2008 – supplementary material, 26). According to this study, the community in the eco-region undertake various movements during different seasons and for various purposes. However, the dominant pattern of movement (mobility) is for land access for farm, which takes place in the direction of forest land. Another major mobility is associated with search of animal feed, shade and water for livestock, mainly during dry season. This latter movement also takes place in the direction of forestland. These two movements are what have been identified as major drivers of deforestation as described in this PDD (section 3.1). Field assessment combined with satellite image analysis about encroachment also revealed a pattern of mobility of the community that helped to determine the size of leakage belt (see the supplementary material 26). This study was further strengthened with expert opinion to determine the distance farmers travel either for deforesting a new spot for farmland, for fetching wood products such as construction and fuelwood and for dry season grazing. The expert opinion analysis was conducted in a round table meeting organized for experts drawn from four districts in the eco-region.. In the meeting each expert, based on their

experiences, was asked to estimate likely distances farmers travel for a new farm plot and for fetching wood from their residence centre. The estimates provided by the experts presented, discussed and finally through a consensus building approach an agreed upon mobility distance of 6 km was approved. Using this 6 km mobility distance, the leakage belt was delineated from the boundary of the project area (see Figure 23). This distance was based on input from local experts as to a reasonable distance a small-scale farmer would travel to establish a new agricultural area, collect fuel wood and construction wood. The leakage belt for the project include areas which could be deforested and are suitable to non-forest use in the RR within a reasonable distance of access to a small scale farmer. It has a total area of 398,532 hectares: 220,010 ha of non-forest, 30,418 ha of dry evergreen and 148,102 ha of moist evergreen forests (Figure 23).

1.1.4. Leakage Management Area: “Leakage Management Area (LMA) is non-forest areas located outside the project area in which the project proponent intends to implement activities that will reduce the risk of displacement leakage”. For this project, LMA was determined to be all non-forest areas within a 1 km buffer around the project area, not included in the areas of the LK listed above. A similar procedure of expert opinion as that of mobility analysis, was followed to determining area for leakage management. Besides, the LMA was defined to match with the proposed project implementation activity plan (supplementary material 21) which was designed based on the mobility analysis work and possible effective leakage due to the project implementation. This area covers 72,924 hectares.

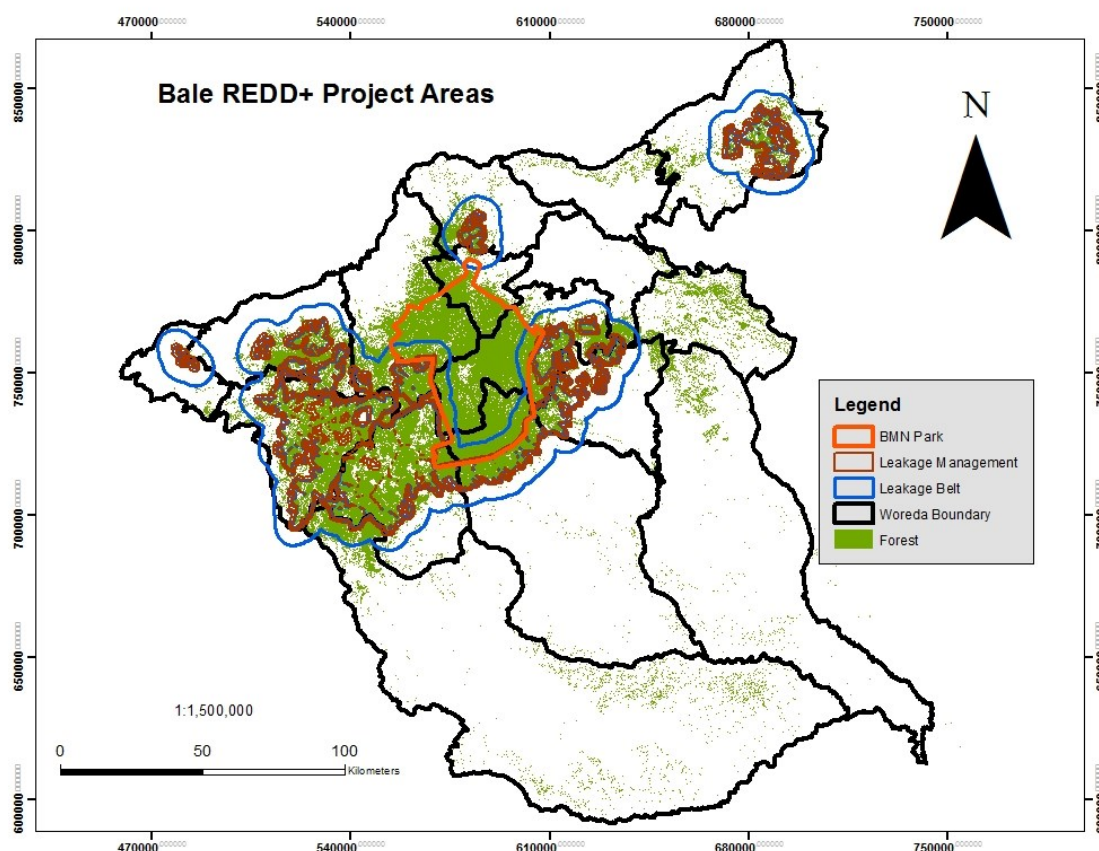


Figure 23: Map of Project Leakage Belt and Leakage Management Area for Bale Mountain REDD+ project.

1.2. Temporal boundaries:

1.2.1. Starting date and end date of the historical reference period

The historical reference period for the BMERP is as follows: starting date is 2000 and end date is 2011. Interim years of 2005 and 2009 were analyzed as well, providing three historical time periods of 2000-2005, 2005-2009 and 2009-2011.

1.2.2. Starting date of the project crediting period of the BMERP activity

The length of the project crediting period covers 20 years from 2012 to 2031.

1.2.3. Starting date and end date of the first fixed baseline

The starting and end dates of the first fixed baseline period for BMERP is 10 years from 2012-2021.

1.2.4. Monitoring period

Deforestation monitoring will be every 3 years and carbon change monitoring every 5 years.

1.3. Carbon pools

This project considered above ground and below ground biomass pools only (Table 11). Instead of using defaults from the literature a forest carbon stock assessment was conducted in the Bale Mountains Eco-region to obtain a relatively better estimate. Based on the estimated above ground carbon stock a below ground carbon stock was estimated using the root-shoot ratio as proposed by IPCC GPG 2003.

With regards to its significance:

Above ground biomass: Represents the pool where the greatest carbon stock change will occur.

Below ground biomass: Recommended by the methodology as it usually represents between 15% and 30% of the above-ground biomass

Dead wood: Conservatively excluded because since deadwood (standing and lying) are mostly collected by farmers as fuelwood under both baseline and project case, they were considered as insignificant proportions of carbon stocks in the project area and also envisaged to be largely stable

Harvested wood products: Under the baseline scenario selective logging occurs in very small scale and, therefore, harvested wood products have been considered insignificant and conservatively excluded.

Soil organic carbon: Conservatively, it was decided to exclude. This was due to most of the deforestation for conversion is into perennial crops like coffee, enset (false banana), and chat. Although there are conversion to annual crops like Barley and wheat in the dry forest area, these are also in high altitude area with slow loss of soil carbon pool (Yimer, 2007)

Table 11. Carbon pools included or excluded within the boundary of the proposed AUD project activity (Table 3, VM0015 v 1.1).

Carbon pools	Included / TBD / Excluded	Justification / Explanation of choice
Above-ground	Tree: Included	Represents the pool where the greatest carbon stock change will occur.
	Non-Tree: excluded	Baseline land cover is annual crop or pasture grass
Below Ground	Included	Recommended by the methodology as it usually represents between 15% and 30% of the above-ground biomass.
Dead wood	Excluded	: Conservatively excluded because Since deadwood (standing and lying) are mostly collected by farmers as fuelwood under both baseline and project case, they were considered as insignificant proportions of carbon stocks in the project area and also envisaged to be largely stable
Harvested wood products	Excluded	Under the baseline scenario selective logging occurs in very small scale and, therefore, harvested wood products have been considered insignificant and conservatively

		excluded.
Litter	Excluded	Not to be measured according to the latest VCS AFOLU Requirements (version 3.4).
Soil organic carbon	Excluded	Conservatively, it was decided to exclude Most of the deforestation for conversion is into perennial crops like coffee, esnet (false banana), and chat. Although there are conversion to annual crops like Barley and wheat in the dry forest area, these are also in high altitude area with slow loss of soil carbon pool (Yimer, 2007)

1.4. Sources of GHG emissions:

The sources of GHG emissions included within the boundaries of the BMERP are listed in the table 12.

Table 12. Sources and GHG included or excluded within the boundary of the proposed AUD project activity (Table 4, VM0015, v 1.1).

Source		Gas	Included?	Justification/Explanation
Baseline	Biomass burning	CO ₂	yes	Counted as carbon stock change
		CH ₄	No	
		N ₂ O	No	
		Other		
	Livestock emissions	CO ₂		Not a significant source
		CH ₄		The major baseline activity is conversion of forestland to agriculture land by small holder farmers, not to grazing land
		N ₂ O		
		Other		
Project	Biomass burning	CO ₂	No	Counted for as changes in carbon stocks
		CH ₄	No	The BMERP is implementing activities that avoid conversion of forests to cropland and grazing / pasture land which can reduce emissions of N ₂ O and CH ₄ that are associated with biomass burning used to clear the land, fertilizer use and other agricultural practices that would have occurred if the forests had been converted.
		N ₂ O	No	Considered insignificant according to VCS Requirements Document 8 October 2013, v3.4
	Livestock emissions	CO ₂	No	Not a significant source
		CH ₄	No	Raising livestock is not a widespread baseline activity and the BMERP will not promote the raising of livestock or result in an increase of this activity compared to the baseline. Therefore, livestock emissions are conservatively excluded.
		N ₂ O	No	Not significant

4.5 Baseline Scenario (G2.1)

Baseline scenario with respect to Climate

The baseline land use scenario can lead to loss of 84,149 ha of forest habitat, leading to loss of diverse genes, several species, ecosystems and associated goods and services the society at large. The project intervention, however, maintains and enhances the capacity of the forest to provide these essential goods and services for the local community and the society at large, and conserve biodiversity that helps to be resilient to climate change. The project can also generate additional revenue through carbon finance highly needed for local development, sustainable forest management and transformation of the local economy.

In the following sections the baseline scenario is described and justified in detail, including analysis of historical land-use and land-cover change and analysis of the agents, drivers and underlying causes of deforestation. In Section 4.6 the additionality of project activities is demonstrated relative to this baseline scenario, and to a set of other possible baseline scenarios.

Step 2. Analysis of historical land use and land cover change

A comprehensive steps and processes as required by VM0015, v 1.1 methodology to establish the baseline scenario is presented in (supplementary material 04). The general steps followed involved the following main activities:

1. Satellite image acquisition, analysis and determination of **historical deforestation rate** and production of bench mark map;
2. Identification of agents of deforestation, **modeling and projection of deforestation** from the bench mark forest map and year to end of the project period,
3. **Forest inventory and collection of forest biomass** data, and
4. Computing **carbon stocks and changes** from combination of step 2 and 3.

2.1. Collection of appropriate data sources (2.1. VM0015, V1.1):

An analysis of land-use and land-cover change of the reference region was conducted for the reference period (2000-2005-2009 and 2011) using medium resolution multi-temporal satellite imagery and validated using a combination of high-resolution satellite images. Satellite images used in these analyses are listed in Table 13. Images for 2000 and 2005 were obtained from the Global Land Cover Facility (GLCF). All images for the 2009 and 2011 mosaics were downloaded from the USGS Global Visualization Viewer (GLOVIS). The four time periods were selected to simultaneously investigate and detect whether introduction of PFM has contributed to reduction of deforestation or not by considering two images pre-PFM (2000 and 2005) and the other two in post-PFM (2009 and 2011) periods.

Table 13: Imagery used for land use-land cover change analysis (Table 5, VM0015 v 1.1)

Year of analysis	Vector (Satellite)	Sensor	Resolution		Coverage (km ²)	Acquisition date (DD/MM/YY)	Scene or point identifier	
			Spatial [m]	Spectral [bands]			Path/ Latitude	Row/ Longitude
2000	Landsat	ETM ⁺	30	6	185 x 185	24/01/01	166	055
	Landsat	ETM ⁺	30	6	185 x 185	24/01/01	166	056
	Landsat	ETM ⁺	30	6	185 x 185	28/11/00	167	055
	Landsat	ETM ⁺	30	6	185 x 185	28/11/00	167	056
	Landsat	ETM ⁺	30	6	185 x 185	05/02/00	168	055
	Landsat	ETM ⁺	30	6	185 x 185	05/02/00	168	056
2005	Landsat	ETM ⁺	30	6	185 x 185	05/12/05	166	055
	Landsat	ETM ⁺	30	6	185 x 185	05/12/05	166	056
	Landsat	ETM ⁺	30	6	185 x 185	12/12/05	167	055
	Landsat	ETM ⁺	30	6	185 x 185	12/12/05	167	056
	Landsat	ETM ⁺	30	6	185 x 185	03/12/05	168	055
	Landsat	ETM ⁺	30	6	185 x 185	01/01/05	168	056
2009/	Landsat	TM	30	6	185 x 185	25/01/10	166	055

10	Landsat	TM	30	6	185 x 185	25/01/10	166	056
	Landsat	TM	30	6	185 x 185	01/02/10	167	055
	Landsat	TM	30	6	185 x 185	01/02/10	167	056
	Landsat	ETM+	30	6	185 x 185	12/11/09	168	055
	Landsat	ETM+	30	6	185 x 185	05/06/09	168	055
	Landsat	TM	30	6	185 x 185	07/11/10	168	056
2011	Landsat	TM	30	6	185 x 185	12/01/11	166	055
	Landsat	TM	30	6	185 x 185	12/01/11	166	056
	Landsat	TM	30	6	185 x 185	18/12/10	167	055
	Landsat	TM	30	6	185 x 185	10/01/11	168	055
	Landsat	TM	30	6	185 x 185	10/01/11	168	056
	Landsat	ETM+	30	6	185 x 185	13/12/11	167	056
	Landsat	ETM+	30	6	185 x 185	29/12/11	167	056
	SPOT	HRV	2.5	3	75 x 75	12/04/11	N241-N256	E179-E204
	SPOT	HRV	2.5	3	75 x 75	12/09/11	N179-N241	E149-E184
	SPOT	HRV	2.5	3	75 x 75	12/14/11	N225	E129-E150

2.2. Definition of classes of land-use and land-cover (2.2. VM0015, v1.1):

Ethiopia's definition of forest was too small-scale to be achieved through the analysis of medium resolution imagery. Therefore, in order to be as conservative as possible, areas identified as forest but less than 0.9 ha was filtered out and assigned a non-forest category. In addition, identified forest areas generally had canopy covers of greater than 30%.

The land-cover change analysis performed by Kidane *et al* (2012) was used to inform land use and land cover classes chosen. In addition, land cover categories that didn't have significantly different biomass values and/or not to be distinguished reliably using Landsat imagery were combined (Table 14). Accordingly, six classes were chosen for initial land cover classification, namely: **afro-alpine grassland**, **Erica shrub**, **dry evergreen forest**, **moist evergreen forest**, **woodland** and **agricultural land**.

The **afro-alpine grassland** and **Erica shrub land** covers were defined primarily by elevation, being above ~3,400 meters, and visual interpretation from SPOT imagery (2011). These two land covers were later combined into one land cover class, **shrubland**, as they were not of interest as land covers actively replacing either dry or moist evergreen forest.

Sparse tree cover and open grazing land characterize the land cover **woodland**. It is generally found below 1,200 meters elevation.

Finally, agricultural land includes large-scale intensive cropland to small-scale subsistence cropping. It is the most common land cover replacing moist and dry evergreen forests. The **woodland** and **agricultural land** was later combined to represent **non-forest** to simplify classification accuracy.

The forest types classified were separated into **moist** and **dry evergreen**.

Both strata of forest were primarily located above 1,500 m of elevation and were identified by their canopy characteristics and location on the northern (e.g. dry) and southern (e.g. moist) flanks of the Bale Mountain. Precipitation, derived from the Tropical Rainfall Monitoring Mission (TRMM) was a factor included in classifying images; however, this sensor is known to have difficulty performing accurate estimates over mountainous regions, hence it was only used as a relative estimate.

Table 14. List of all land use and land cover classes existing at the project start date within the reference region (Table 6, VM0015 v 1.1)

Class Identifier		Trend in Carbon stock	Presence in*	Baseline activity**				Description
ID _{cl}	Name			LG	FW	CP	AG	(including criteria for unambiguous boundary definition)

1	Dry evergreen forest	Constant	RR, PA LK	N	Y	N	Y	Lowland and highland dry forest are included in one class. These are located on the north side of the Bale Mountain.
2	Moist evergreen forest	Constant	RR, PA LK	N	Y	N	Y	Mainly highland forest above 1,500 m elevation and located exclusively on the south face of Bale Mountain.
3	Non-forest	Decreasing	RR, LK, LM	N	Y	Y	Y	This class is a combination of recently deforested areas, afro-alpine grassland, erica shrubland, woodland and cropland.

*RR = Reference region, LK = Leakage belt, LM = Leakage management Areas, PA = Project area. **LG = Logging, FW = Fuel-wood collection; CP = Charcoal Production; AG = agriculture expansion (yes/no)).

2.3. Definition of categories of land-use and land-cover change (2.3 VM0015 v 1.1)

The project defined three land-use and land-cover initial classes (table 12 above) and two possible combinations of land-use and land-cover change categories namely dry forest to non-forest and moist forest to non-forest categories as shown in Table 15 and 16 (VM0015 V 1.1 Tables 7.a and 7.b.).

Table 15. Potential land-use and land-cover change matrix (Table 7.a. VM0015 v 1.1)

Final LU/LC class	Initial LU/LC class	
	<i>Dry evergreen forest(ha) (I1)</i>	<i>Moist evergreen forest (ha) (I2)</i>
Non-forest (F1)	118128	59726

Table 16. List of land-use and land-cover change categories (Table 7.b. VM0015 v 1.1)

ID _{ct}	Name	Trend in Carbon Stock	Presence in	Activity in the baseline case			Name	Trend in Carbon Stock	Presence in	Activity in the project case		
				LG	FW	CP				LG	FW	CP
I1/F1	Dry evergreen forest	Constant	RR, PA, LK	Y	Y	Y	Non-forest	Decreasing	RR, LK, LM	Y	Y	Y
I2/F1	Moist evergreen forest	Constant	RR, PA, LK	Y	Y	Y	Non-forest	Decreasing	RR, LK, LM	Y	Y	Y

LG = logging

FW = fire wood collection

CP = charcoal production

2.4. Analysis of historical land-use and land-cover change (VM0015 v 1.1):

2.4.1. Image analysis and pre-processing of images: It was decided that four time periods were going to be analyzed, in order to identify whether deforestation rates had been affected by the implementation of participatory forest management (PFM) in a subset of weredas in 2009. Therefore, the years to be analyzed were 2000, 2005, 2009 and 2011. Images for 2000 and 2005 were taken from the Global Land Cover Facility (GLCF), which have already been gap-filled and corrected to surface reflectance values. Landsat 5 was preferred for the 2011 and 2009 mosaics due to the problem of gaps in Landsat 7 imagery. Unfortunately, one scene from 2011 (path 167 and row 56) did not have an adequately cloud free image in the Landsat 5 archive; therefore two scenes from the Landsat 7 sensor were used, where gap-filling was possible. For 2009, two images for the 168 path and 55 row from the Landsat 7 archive were used and gap-filled. All images for the 2011 and 2009 mosaics were downloaded from the USGS Global Visualization Viewer (GLOVIS).

GRASS and R's "landsat" package were used for most pre- processing steps. The main pre-processing steps for Landsat 5 images were: 1) atmospheric correction using Dark Object Subtraction (DOS) (see 04),

2) topographic correction (see Supplementary information 04) and 3) manual cloud removal using the region of interest (ROI) tool in ENVI 4.8. For the two Landsat 7 images, histogram matching (see supplementary material 04) was performed instead of atmospheric correction and each were terrain corrected separately, due to different illumination conditions. Gap-filling was performed using GRASS's mosaicking tools after clouds were manually removed from both images. Finally, the 6 scenes for each year were mosaicked using GRASS to create an image large enough to cover the entire 16 wordas of the project (see supplementary material 4).

2.4.2. Interpretation and classification: Two LU/LC maps were generated for two different time points and then compared to detect LU/LC changes. A number of Ground Control Points (GCP) were chosen manually from SPOT and Landsat imagery, depending on availability, and divided into training and testing datasets. A minimum of 29 and maximum of 59 of training and testing GCPs were used for each class and time period.

Supervised classification of each period image was run. Random Forest for land cover classification Algorithm developed for R, was used for classifying images due to ENVI's maximum likelihood classification (MLC) not producing sufficiently accurate land cover maps for the study area. This algorithm has the advantage of allowing several datasets to be included and ranks the contribution of each data layer to overall accuracy. Classification accuracy was checked and validated using a combination of randomly generated and manually chosen ground control points (GCPs). The Methodological LUC Annex provides detailed numbers of GCPs per land-cover as well as accuracy assessment by class. The accuracy of all 4 classified images ranged from 85-95% with all forest classes exhibiting at least 80% producer's and user's accuracy.

Change detection and deforestation rate calculation was performed after classifications of the images for each time period were completed. Maps with change detections for the three pairs (2000-2005; 2005-2009; 2009-2011) are presented in Figures 23a, b and c. Deforestation rates for the pair of periods were estimated using the following equation taken from Puyravaud (2003) and the results presented in Table 17.

$$r = \frac{1}{t_2 - t_1} * \ln\left(\frac{A_2}{A_1}\right)$$

Where,

r is the estimated rate of deforestation,
 t_2 is the final year of analysis,
 t_1 is the initial year of analysis,
 A_2 is the forest area at t_2 and
 A_1 is the forest area at t_1 .

Table 17. Forest cover and loss in the reference region during the reference period 2000-2005-2009-2011.

Forest Class	Observed forest 2000	Observed forest 2005	Observed forest 2009	Observed change (2000-2005)	Observed change (2005-2009)	Observed change (2009-2011)	Observed change (2000-2011)	Observed change (2000-2005)	Observed change (2005-2009)	Observed change (2009-2011)	Weighted average change
	Ha	Ha	Ha	Ha/yr	Ha/yr	Ha/yr	Ha/yr	%	%	%	%
Dry evergreen forest	228020	174571	136065	109892	10689.8	9282	13539.5	5.3	6.2	10.7	
Moist evergreen forest	508105	476332	468297	448379	6354.6	7758.25	10699.5	1.3	0.4	2.2	
Reference Region	736125	650903	604362	558271	17044.4	17040.25	24239	2.5	1.9	4	

Overall, weighted average historical rates for the reference period (2000-2011) were 6.6% for dry forest, 1.1% for humid forest and 2.5% for both forest strata combined. The first two values were used for projecting the baseline for each forest strata.

2.4.3. Post-processing images: Ethiopia's definition of forest is 0.05 ha, which is too fine-scale to be achieved through the analysis of 30-meter medium resolution imagery. Therefore, in order to be as conservative as possible, areas identified as forest but less than 0.9 ha were filtered out and assigned a non-forest category. This filtering process was achieved using ENVI's post-classification segmentation tool and choosing the option for 8 adjacent pixels and a minimum population size of 9. After segmentation was performed for dry forest and humid forest separately, any obvious mis-identification of dry or humid forest (based on whether the forest was identified on the northern or southern face of the mountain) was corrected using ENVI's band math tool or decision tree classifier. The final land cover map was generated using the several segmented forest layers and initial land cover map for other classes and combined using ENVI's decision tree classification tool (see Figure 24).

Accuracy assessment was performed iteratively throughout post-processing, with interim land cover maps and segmentation layers used in subsequent runs of the random forest classification tool until the required accuracy by the methodology was achieved.

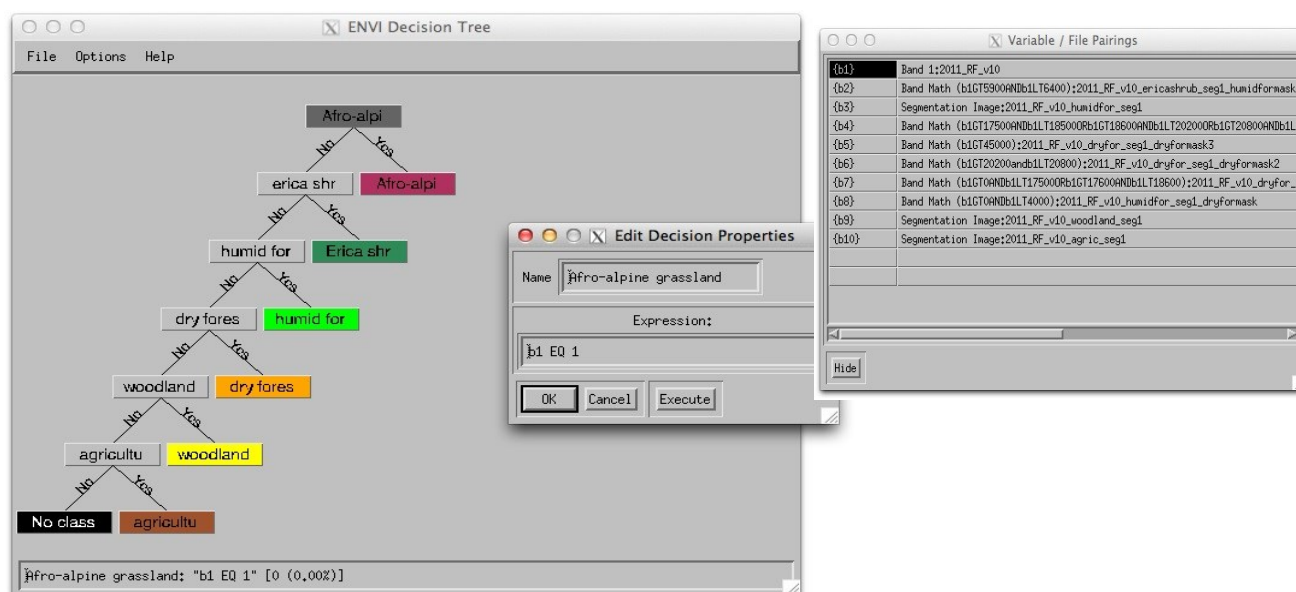


Figure 24. Decision tree for producing final map from segmented layers, with list of bands used as “variable pairings” in ENVI 4.8.

Time series analysis

Final land cover maps were completed after initial land cover change analysis, whereby pixels identified consistently as erica shrub and afro-alpine grassland were combined to form a new land-cover class “shrubland”. These pixels were kept consistently throughout the time period. Areas identified as agriculture and woodland were combined to form a new land-cover class “non-forest” due to some difficulty reliably differentiating them in lower altitude areas. Forest areas had to be consistently classified throughout all four time periods to remain in the 2011 image. Therefore, pixels identified as a “non-forest” class in a previous time step and then forest in a subsequent time step, were removed from forest classes and identified as “non-forest”. This phenomenon was likely due to the mistaken identification of fallows or agro-forestry lands as forest and, therefore, they were removed and assigned a non-forest land cover class. This was consistent with the methodology, which states that any forest identified in the benchmark map must have been forest continuously for 10 years before the project start date. Pixels that were forest in the previous time step and then identified as a “non-forest” in the subsequent time step were identified as deforested. Deforested pixels were identified as “non-forest” in later time periods so as to only document deforested areas occurring for each time period. In addition, where data was missing due to poor topographic or atmospheric correction or clouds, a layer was generated from 2000 and 2010 land cover maps and missing data was filled where land cover classes agreed between these two layers.

This analysis was performed using ENVI's decision tree classification tool (see Annex 3 for text of the decision tree used). Final maps for all 3 change detections are presented in Figures 25 a, b and c).

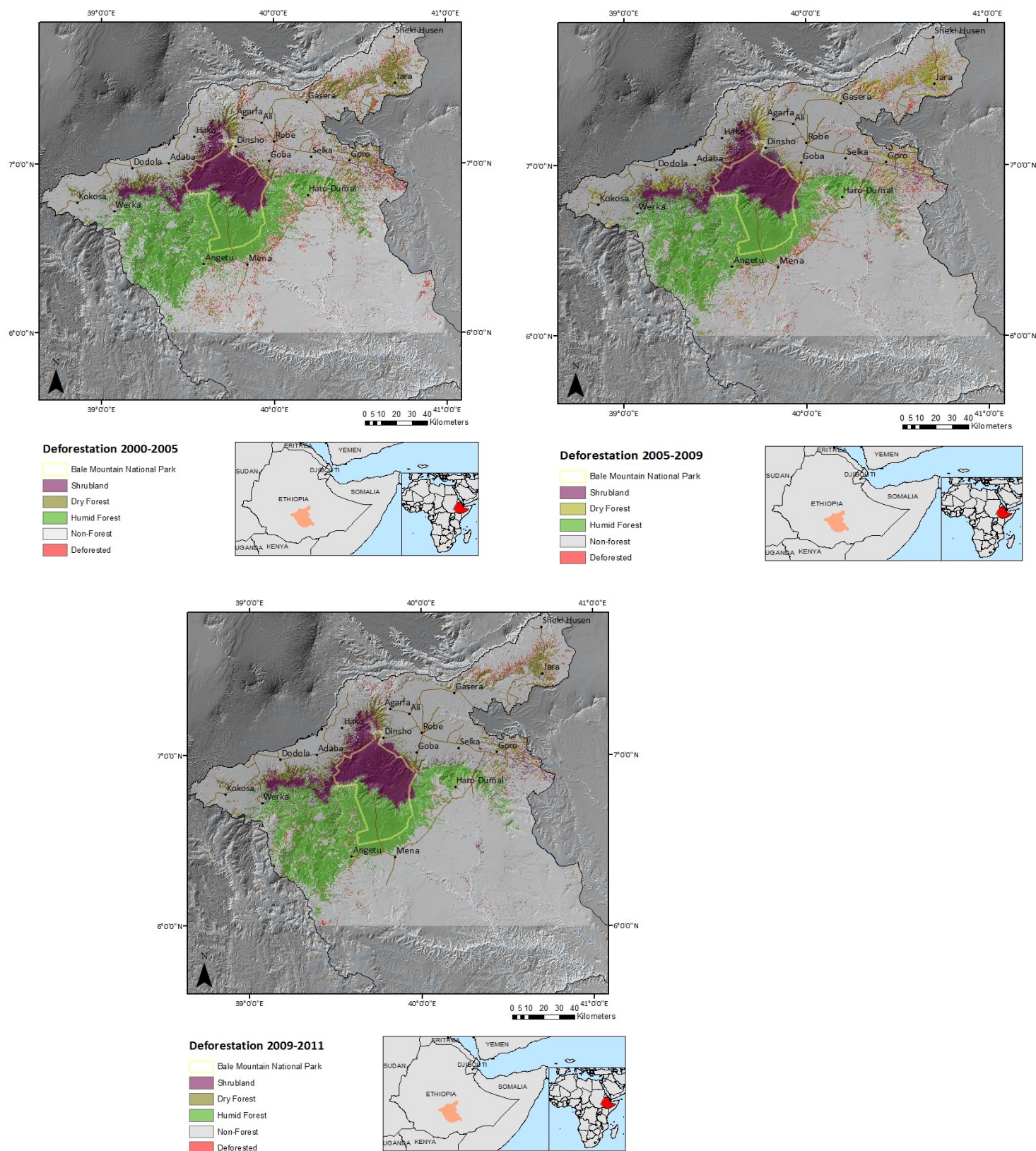


Figure 25. Land cover change map for 2000-2005 (above left); 2005-2009 (above right) and 2009-2011 (lower middle) in Bale Eco-region

Benchmark Forest Maps

Using the maps presented in Figures 4 and 5, benchmark forest maps were generated for all 4 years using only humid and dry forest class categories. These have been presented in the report *Bale Mountain REDD+ project: Historical Land-Cover Change and Projected Deforestation Modeling* report. Those maps were used for identifying forest area estimates for the reference region, project area and leakage belt. The deforested areas in the above presented maps were used for land-cover modeling to train an agent-based model developed using *Dinamica EGO* and producing estimates of annual deforestation rates.

2.5. Map accuracy assessment

Each classification was tested using year-specific generated GCPs. Table 18 presents producer's and user's accuracy for each land-cover class and each year. Accuracy was assessed only for areas within the boundaries of all 16 weredas. As required overall accuracies for each year are over 80% as well as forest class accuracies. There are two classes that are around 77%, afro-alpine grassland in 2009 and agricultural land in 2000; however, as these classes later were combined to form shrubland and non-forest respectively, this less than 80% accuracy was not considered a problem.

Table 18. Producer's and user's accuracy for each land-cover class and year.

Land Cover Class	2000		2005		2009		2011	
	User's Accuracy [%]	Producer's Accuracy [%]	User's Accuracy [%]	Producer's Accuracy [%]	User's Accuracy [%]	Producer's Accuracy [%]	User's Accuracy [%]	Producer's Accuracy [%]
Afro-alpine grassland	91.7	97.1	100	100	77.1	93.1	100	100
Erica shrub	97.8	89.8	97.6	100	92.1	85.4	100	100
Dry forest	83.7	87.2	92.1	97.2	92.1	97.2	100	87
Humid forest	100	80	100	90.5	90.9	95.2	98.3	96.6
Woodland	88	100	100	96.6	100	86.2	90	100
Agricultural land	80.4	78.7	95.4	93.2	92.7	86.4	89.7	94.6
Overall Accuracy (%)	88.5		95.9		90.5		95.9	
Kappa coefficient	0.86		0.95		0.89		0.95	

2.6. Preparation of methodology annex to the PDD.

In addition to the above contents of the PDD, an entirely technical report has been prepared detailing the steps taken for pre-processing; classification methods, post-classification processing and accuracy assessment (**refer to supplementary material 05: Methodological annex/Land-Use Land Cover**).

Step 3. Analysis of agents, drivers and underlying causes of deforestation and their likely future development

3.1. Identification of agents of deforestation

The two main agents of deforestation have been recognized in the Bale eco-region, namely: resident local smallholder farmers and migrant smallholder farmers. The proportion of migrant farmers as agents of deforestation appears to be insignificant and also differ considerably by woreda and time. Although the problem has been serious. However, due to ongoing efforts by Farm Africa/SOS Sahel Ethiopia, OFWE and Oromia Regional State, migration is on the decline.

Deforestation in the reference region during the historical reference period has been overwhelmingly dominated by one main agent group, smallholder farmers. As defined here smallholder farmers are a broad group comprising people of one ethnic group (Oromo) and insignificant number of others (Mostly Amhara) who grow annual or perennial crops for consumption or sale.

The illegal migrants are those coming from different parts of the country and Oromia where they have been suffering land degradation and insufficient land holdings due to fast population growth. They illegally clear forest land and convert into agriculture.

The smallholder farmers typically require no permits from central government, and so their expansion is consistent with the VCS concept of 'unplanned deforestation'. The migrant small holder farmers' also don't require the permission of the government but the recognition by a local farmers is required.

The population growth in the reference region has been increasing over the reference period (Sources: Ethiopian Central Statistical Agency data of 1994 & 2007). Population density and growth were considered important factors for predicting deforestation occurrence; however, as the data was relatively sparse (to the kebele level at best) and only measured in 1994 and 2007, a crude factor map of population growth (Figure 26) was generated using the following Equation.

$$PGR = \frac{\ln(P(t_2)) - \ln(P(t_1))}{(t_2 - t_1)}$$

Where t_2 is the final year, t_1 is the initial year and P represents the population measured at t_2 or t_1 .

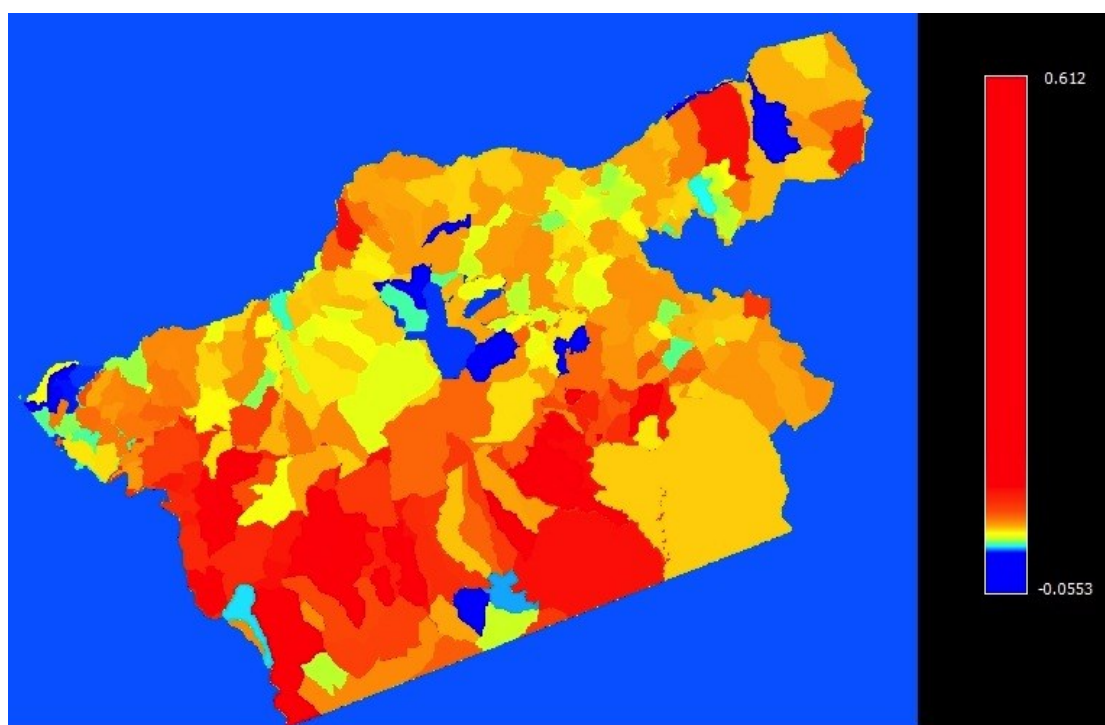


Figure 26. Population growth estimates at the kebele or wereda level, depending on data availability. Generated from 1994 and 2007 census data.

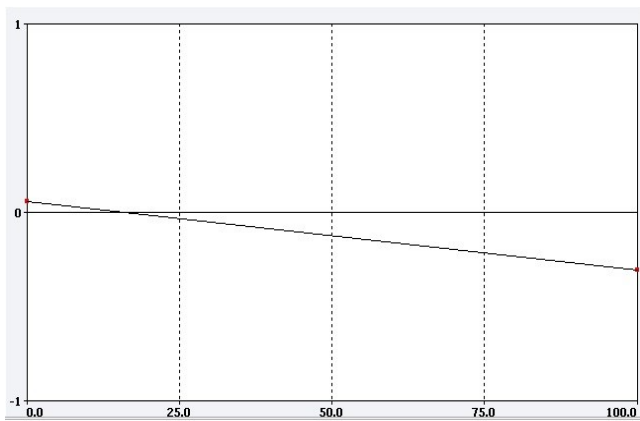


Figure 27. Weights of evidence for dry forest and population growth.

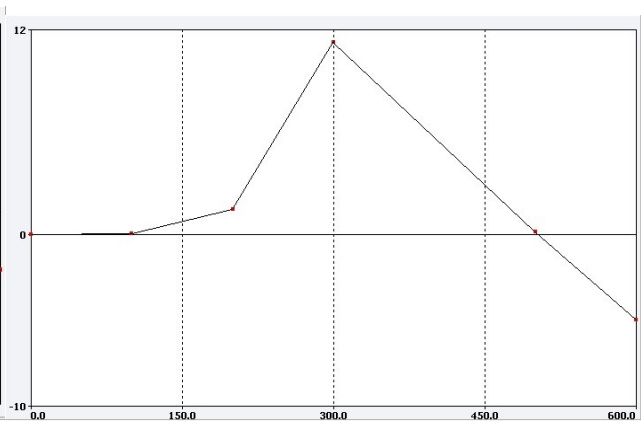


Figure 28. Weights of evidence for humid forest and population growth.

Table 19. Quantity of forest cover and loss in the reference region during the reference period 2000-2005-2009-2011.

	Observed forest 2000	Observed forest 2005	Observed forest 2009	Observed forest 2011	Observed change 2000-2005	Observed change 2005-2009	Observed change 2009-2011	Observed change 2000-2005	Observed change 2005-2009	Observed change 2009-2011	Weighted average change 2000-2011
	Ha	Ha	Ha	Ha/yr	Ha/yr	Ha/yr	Ha/yr	%	%	%	%
Dry forest	228020	174571	136065	109892	10689.8	9282	13539.5	5.3	6.2	10.7	6.6
Humid forest	508105	476332	468297	448379	6354.6	7758.25	10699.5	1.3	0.4	2.2	1.1
Reference Region	736125	650903	604362	558271	17044.4	17040.25	24239	2.5	1.9	4	2.6

3.2. Identification of Drivers of deforestation

The key drivers of deforestation are agricultural expansion, unsustainable firewood and charcoal production, which were due to population growth. In some regions such as Harena Buluk and Nansabo woredas there was a recent immigration from outside the Bale Eco-region in the earlier 2000s. The percentage of this migration on the total population growth is very low. As drivers of quantity, it is clear that population growth has been manifesting through increasing numbers of households in new settlements, which are responsible for the majority of the deforestation. Market driven deforestation occurs in some small patches, with *chat* plantations being one of the cited causes.

3.2.1. Driver Variables Explaining Quantity of Deforestation

VM0015, V1.1 suggests stratifying the area based on differences in agents of deforestation; however, the agents, except the migrants who are very insignificant, acting are present throughout the reference region. There was a decision to stratify the baseline by forest type due to their differing rates of deforestation and differences in access by agents

3.2.2. Driver variables explaining the location of deforestation

The variation in the location of recent unplanned deforestation is evidently not random across the reference region. It is concentrated in certain areas from one time period to the next, and a number of factors influence this (Table 20). The available infrastructure GIS layers were location of settlements, towns and roads. The settlements layer was treated slightly differently than the other two infrastructure layers, as shapefile of settlements exhibited several hundred points over the reference region. Therefore, factor maps indicating simple distance from each point as well as density of points was used. It was found that density of settlements was a far superior predictor of deforestation location (see Figure 22). Unsurprisingly, the highest density of settlements is north of Bale Mountain near the areas of dry forest, which exhibit significantly higher rates of deforestation.

Other infrastructure variables were created by performing distance analysis in ArcGIS. At first factor maps of simple Euclidean distance were generated; however, these performed very poorly in early model versions. Therefore, it was considered necessary to include the influence of slope in distance measures. This was accomplished by using ArcGIS's cost surface tool whereby the aforementioned slope layer was used as an estimate for cost of travel. These cost surface layers were generated from road and town shapefiles (see Figures 23 and 24).

Population density and growth were also considered important factors for predicting deforestation occurrence; however, as the data was relatively sparse (to the kebele level at best) and only measured in 1994 and 2007, a crude factor map of population growth was generated using Equation 2.

$$PGR = \frac{\ln(P(t_2)) - \ln(P(t_1))}{(t_2 - t_1)} \quad (2)$$

Where t_2 is the final year, t_1 is the initial year and P represents the population measured at t_2 or t_1 .

Table 20. Factors correlated with location of deforestation during the historical reference period.

Factor Map		Source	Variable represented		Meaning of the categories or pixel value		Other Maps and Variables used to create the Factor Map		Algorithm or Equation Used	Comments
ID	File Name		Unit	Description	Range	Meaning	ID	File Name		
1	Settlements	OFWE	Settlement km ⁻²	Density	0-50	Density	NA	NA	NA	To capture the impact of greater pressure due to the proximity to several

										settlements
2	Roads	OFWE	Slope* distance (km)	Slope cost distance	0-290,000	Distance including slope effect	7	Slope	ArcGIS cost distance	
3	Protected Area	OFWE	Classes	Protected area	1- protected 2- not	Classes of protection	NA	NA	NA	
4	Natural Coffee Area	Bale REDD+ experts	Classes	Natural coffee area	1- coffee area 2-not	Presence of natural coffee	6 & 7	Slope & elevation	Humid forest, slope (0-15) & elevation (1350-1550)	Assumed it would be unlikely to be deforested.
5	Distance to deforestation	Dinamica	Meters	Direct distance from deforestation	250-10,000	Distance in meters		Land cover maps	Dinamica creates this map iteratively	250 meter is the smallest unit due to the resolution of imagery used for modeling.
6	Elevation	SRTM	Meters	Elevation	0-4300	Meters	NA	NA	NA	NA
7	Slope	SRTM	Degrees	Slope	0-70	Degrees	6	Elevation	Derived in ENVI	
8	Population Growth	Census (1994 & 2007)	% growth	Growth	-5%-60%	Percent Growth		Population Density data	See Equation 3	

3.3. Identification of underlying causes:

The direct drivers of deforestation listed above are the expression of several underlying issues principally weak law enforcement, absence of forest managing institution at grass roots level, poverty, lack of poor access to education and population growth (Table 21). The population growth in Ethiopia, including in the Bale Ecoregion, is 2.9% per year. All of these agents and drivers are common to both the RR and PA. The drivers and underlying causes were shown in table 21 below.

Table 21. Underlying causes of deforestation contributing to forest clearance

Deforestation		References	How they affect the drivers	Likely future development	Measures to address
Drivers	Underlying causes				
Agricultural expansion(subsistence farming	• Population growth	Ethiopian CSA data	The new born & youths people needs extra lands for agriculture which is mostly obtained through forest clearance	As the Ethiopian population growth rate is 2.9% per annum, it is likely the future deforestation will continue similarly	Community awareness on family planning
	• Weak law enforcement	Ethiopian R-PP	The forest laws are weakly enforced to protect forest	If BAU scenario continues, it is less likely the law will be enforced as it has implication on different issues	Under the project scenario the government will be committed to enforce laws and Forest management community will also try to

					take responsibility of enforcing their internal bylaw
	Lack of regulation and policy implementation guidelines on forestry	Ethiopian R-PP	There is forest policy & proclamation but no forest protection and development guideline yet	The forest guideline may take several time to be produced	For implementing REDD+ government may speed up the process of producing the Guideline
	Poverty --- low income	Observation	Local farmers needs more land to increase their income through extensive farming	It is likely the poverty will continue under current situation which may also be more aggravated by the changing climate	Agricultural intensification , livelihood diversification , agroforestry, livestock improvement activities implementation to improve the livelihood of community
Fuel wood collection and construction wood extraction	Lack of alternative energy source,	Ethiopian R-PP	The rural and urban community uses wood for household energy	As the population increases and the lack of energy access remain the same, the use of woodfuel for household energy continues	Cookstove distribution, woodlot establishment for fuelwood
	Lack of construction materials outside forest resources,	Information from local experts	The rural and urban community uses wood for house construction	The rural community has no capacity to buy industrial construction material, they still continue using wood products for house construction in the future	Community based plantation establishment of fast growing species for house construction
Fire (Intentional/unintentional)	Lack of education, awareness	Information from local experts	Farmers use fire to clear agricultural lands and leave it there and it may start later when they are not there. They may not have	Fire remains a means to prepare agricultural land preparation and for honey collection	awareness creation for community, Training on the fire fighting methods ,

			education/knowledge with regards to what the fire destroys		
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3.4. Analysis of chain of events leading to deforestation

Based on the analysis of the historical relationship between the main agent groups, key drivers and underlying causes, it has been found that the following sequence of causative steps have typically led to (baseline scenario) and will lead to(project scenario) deforestation.

Sequence for smallholder farmers

- Small-holder farmers wish to achieve food security and improve their levels of income
- Income growth is mainly dependent on agriculture as opportunities to move into other sectors are often limited.
- Opportunities to intensify agriculture are often limited. By contrast, expansion of farmland into forest areas is relatively easy under current conditions, despite the law.
- Weak forest law enforcement, low investment in forest protection and limited opportunities for current forest-users to protect their resources all facilitate expansion of farmland into forest areas
- Absence of alternative energy sources and construction material lead the farmers to cut trees for household energy and construction
- Fast population growth in the region forced the extra people to clear forests for their subsistence
- These process is accelerated by rising commodity prices, improving road networks, rising populations and other economic development factors

3.5. Conclusion

Due to a paucity of ground data at a resolution that could be related to the small-scale mosaic deforestation exhibited in this region, it was not possible to generate a reliable linear or logistic regression to reach at conclusive evidence. However, analysis presented in the table 18 above indicates an increasing rate of deforestation in the region over the historical time period, albeit with a slight reduction in the humid deforestation rate during the time period 2005-2009. The deforestation rate between 2009 and 2011 showed a significant acceleration from the first time period. *Therefore, it is likely the future deforestation rate continue to accelerate, however, the analysis of the agents and drivers has not provided conclusive evidence as to how much; therefore, the methodology recommends using an historical average approach for the quantitative projection of the future deforestation in Section 5.*

Baseline scenario with respect to Biodiversity

The baseline scenario in the Bale eco-region is not sustainable. It is characterised by high rate of deforestation and forest degradation due to settlement expansion as a result of population growth (CSA, 2007), expansion of agriculture at the expense of natural ecosystems including forests, over grazing and unregulated timber and fuel wood extractions. Deforestation studies by different scholars revealed a rapid shrinkage of montane forests ion the eco-region threatening its biodiversity through large scale habitat loss and degradation (e.g. Kidane et al., 2012; Teshome et al., 2008). For instance, the study by Kidane et al. (2012) reveal an increase in agricultural land from 1.71% in early 70s to 9.34% in 2000s. Similarly pasture lands are expanding very rapidly at a rate of 28 km² per year particularly between 2000 and 2005 at a cost of Erica, Montane and Woodland forests which are shrinking at the rates of 13 km², 15 km² every year. These processes are prominent threat to biodiversity at all levels of biological organization: genes (genetic resources of crop wild relatives), species, and ecosystems. The Bale Eco-region has the highest rate of endemism, compared to similar continental terrestrial habitats, be it in Ethiopia or elsewhere worldwide. For instance, it harbours about 67% of mammals known from the Afromontane eco-region in Ethiopia. It is known that over 50% of such Afromontane habitat at altitudes higher than 1500 m, and about 80% of such habitat surpassing over 3000 m is found in Ethiopia. Over 1500 species of plants are restricted to the Eastern Afromontane Biodiversity Hotspot are also found within the Bale Eco-region. The Eastern Afromontane has been designated at one of the 34 biodiversity hotspots worldwide due to its exceptionally high levels of biodiversity and threats. Over 90% of the original habitat of Eastern

Afromontane has been lost or significantly degraded. The Bale Eco-region is one of the few places that can represent and significantly contribute to the conservation of biodiversity of such local, national, regional and global significance.

The forest is the main production site of Arabica coffee and gene pool for unique and diverse coffee genetic resources isolated from bigger wild coffee gene pool in southwestern Ethiopia, due to the separation by the Great Rift Valley. Recent studies show that deforestation, forest degradation, coupled with the impacts of climate change may threaten coffee production and the wild gene pools within the next 30-40 years. Ethiopia is the only centre of coffee genetic diversity and genes of several other crops originating from this eco-region. Its loss would be a loss for the global coffee industry. Deforestation at the current rate may also lead to land degradation and loss of several goods and ecosystem services provided to the local community and many downstream populations in the lowlands of Ethiopia, northern Kenya, central and western Somalia.

Baseline scenario with respect to communities

Communities living in and around Bale Mountains Ecoregion are totally dependent on the Bale Mountains Eco-region for their livelihoods and livestock grazing and water. The benefits of the communities that will be disappearing in the case of baseline scenario are as follows:

Water catchment: The BM is the source of water for five major rivers (the Wabi-Shebelle, Web, Welmel, Ganale, and Duma) on which an estimated 12 million people depend. The afroalpine wetlands and the Harenna forest hold the water, releasing it year round to the arid and semi-arid areas of south-eastern and southern Ethiopia, including the Ogaden and Somali agricultural belt. The livelihoods and food security of the people in these lowland areas are highly dependent on good environmental management in the highland areas. Water flow is regulated and stabilised in the dry and rainy season through the water retention properties of the highland wetland areas and dry season rainfall in the mountains is crucial to maintain river flow. Overuse of this system would make the water flow seasonal, increase flooding and decrease dry season water availability. In turn this would rapidly increase degradation of rangelands surrounding the few areas with permanent water and increase food aid dependency, a scenario that has already developed in northern Kenya.

Environmental goods and services: BM and surrounding area provide a range of goods and services both locally and nationally, in addition to water provision. Indeed most of the local communities are partially or almost entirely dependent on natural resources. For example, BM provides grazing ground for livestock herds, and a variety of non-timber forest products (NTFP) such as honey and coffee. Unfortunately the natural resources of the area are being treated as open access resources and use is increasing, with concomitant negative impacts such as forest destruction.

In addition, two of the rivers flowing from BM have hydroelectric schemes: the Melka Wakana scheme on the Wabi Shebelle and the Yato mini-scheme on the Yadot River. The produced hydroelectricity supplies the towns of Dodola, Adaba, Dinsho, Robe, Agarfa, Ali, and Goba, and Dola Mena respectively.

The area is also an important climate change reference area. With global warming increasing, climate records of the Bale Mountains will be vital in determining how climate change will affect the afroalpine areas over the forthcoming decades.

Wild coffee: Coffee plays a vital social and economic role in Ethiopia and is part of the national identity. It is also extremely important economically, being a major foreign currency earner. A considerable amount of wild coffee is harvested in the Bale Mountains, and this provides a significant income source for many local communities. However increasing forest and semi-forest coffee management needs to be managed to ensure that biodiversity in the forest is not adversely affected.

Loss of traditional transhumance system (Godantu): The transhumance system of Oromo pastoralists is known as the Godantu system and is a key feature of traditional human use of the Bale Mountains. In this system, livestock, particularly cattle are sent to higher grazing grounds during the months when crops are growing in lower altitude areas or into the forest for shade during the dry season.

The Bale Mountains is relatively environmentally intact. The area is not blighted by an ancient history of cultivation agriculture, land degradation, recurrent drought and chronic food insecurity. However, negative pressures on natural resources in the Bale Mountains are rapidly growing. Unsustainable natural resource exploitation and degradation throughout the area is increasingly threatening the sustainability of the environment, food security and sustainable livelihoods. As a result, the survival of the unique and globally significant fauna and flora of the area is threatened.

Bale's rural communities are seeking to meet their livelihood needs by expanding exploitation of local natural resources. Resource exploitation mechanisms are opportunistic and unregulated. Agricultural land started expanding rapidly, as grazing areas are heavily degraded pushing pastoralists towards new pastures. Forest areas are being cut and cleared, and water systems disrupted. Resource users are taking advantage of the *de facto* open access resource management regimes in the area. There were no land use management plans. Land use rights and ownership was confused and there was no control of resource use. Rapid immigration with unplanned and unrestricted settlement is a significant and mounting problem. Existing settlements are growing, and new settlements are appearing in previously unsettled and environmentally sensitive areas.

The forest area in the Bale Mountains has been shrinking as the result of conversion to agricultural land by subsistence farmers. The types of the subsistence farmers, which are the key agents of drivers of deforestation, were local farmers, migrants from other parts of the country, and agro-pastoralists in the lowland areas surrounding the project area/s. Before the project was started:

- Local farmers were converting the forest land to agricultural land for subsistence farming
- The migrants, most of the time settle deep in the forest and/or join some their relatives already existing in the area and further expand the farm land at the expense of forest land. They also build new houses in the forest.

As there are weak law enforcement with regards to the illegal migrant from different area and the increasing demand for the new land for subsistence agriculture, it is less probable to stop the expansion of deforestation, where the entire reference region is susceptible for conversion to the current land-uses in the baseline scenario.

4.6 Additionality(G2.2)

Project additionality is demonstrated below following the methodology, which requires use of the most recent approved VCS "*Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other land use (AFOLU) Project Activities*", namely VCS Tool VT0001.

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

The project passes this screening as the project start date is after 1 January 2002.

The steps of the tool have been applied as follows:

Step 1: Identification of alternative land use scenarios to the proposed REDD project activity

Sub-step 1a. Identify credible alternative land use scenarios to the proposed REDD+ project activity

The identified credible land use scenarios under the baseline activities are summarized in the table below (Table 33). In the baseline scenario the forests are mostly cleared for those alternative land uses indicated in the table (Table 22). However, the forests while still as forest (i.e. being before cleared) is also used for small forest based product extraction mainly honey production, and some wood production. These forest based productions are in general focused on non-timber forest products and limited and sustainable timber exploitation.

Table 22. Identified alternative land uses likely to replace the two forest strata under the baseline scenario in Bale Mountain Eco-region.

Alternative land use	Forest stratum	
	Moist forest	Dry forest
	Enset production	Enset production
	Coffee production	Wheat/barley
	Maize production	

The additionality effect of the project is described in the following scenario based assessment: without project scenarios.

Scenario 1: Conversion of forest land to other land uses (Coffee, maize, enset, wheat/barely)

As described above without the project, deforestation and forest encroachments are expected to continue resulting in a considerable area of dry and moist forest being cleared and converted into subsistent small holders agricultural system mainly wheat/barely, enset, coffee and maize production. The projected deforestation shows a total of 84150 ha of forest clearance in the project area during the coming 20 years. Hence this scenario entails an increase in deforestation within the project area as the most economically viable activities would continue to be the same for the surrounding communities. There are two options (scenarios) to reverse this baseline scenario, each of which is described below:

Scenario 2: OFWE to increase its scope of forest management

This scenario is the only likely alternative scenario to the baseline scenario without the project scenario framework. This scenario assumes OFWE will strengthen itself and engage in active forest management and conservation to reduce deforestation rate. This will require a dramatic shift in enforcement of legal requirements and/or government support for protection of the forest need to be put in pace. This requires a significant improvement in the performance of government institutions, both policy formulating and law enforcing institutions such as OFWE, MoA, MEF, police departments and judiciary systems in implementation of a number of policies to ensure the protection and conservation of the environment in the forest areas, linked to social improvement, economic and cultural rights of local communities. Furthermore capacity limitations both in terms human resources and logistics will constrain OFWE from making good conservation progress since this will require a financial resource that is currently beyond the capacity of the OFWE and the government. Therefore, this scenario is less likely to result in a positive biodiversity, community and climate outcomes.

OFWE as a business model virtually has limited community livelihoods development commitment other than sharing any revenue generated from forest management and utilization. Other sectors essential for rural development and climate effect are outside its institutional mandates, hence without the REDD+ project there will be no significant additionality in terms of GHG emission reduction and also enhancing rural livelihoods.

A scenario that could lead to the same results as the project scenario (REDD+) without using Carbon resources is could be a government plan to resettle inhabitants outside the regions, contraceptive campaigns for reducing population growth and agricultural intensification to reduce the need of open forest areas. This however, will still entail huge investment which is unavailable.

Investment analysis made in the project area comparing various options of land use clearly reflects that pending options such as crop cultivation offers better livelihoods (income) than forest conservation for the rural community (Table 34). This implies that without the REDD+ project and additional direct and indirect benefit from it, climate and rural development additionalities are clearly unlikely.

Furthermore, given its business model OFWE's focus is more on economic management of forests and wildlife, hence focus on those resources that assist the enterprise to remain financial viable. These are mostly planted forests and controlled hunting areas. However, with assistances from development partners OFWE is fully committed to support and work together in the improved management of natural forests as well, particularly by engaging local communities in the form of Joint Forest Management (JFM).

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

Despite these regulations, prevailing institutional weakness and lack of law enforcement is making the forests to be threatened by illegal and spontaneous expansion of farmlands and grazing lands.

Credible land use scenarios with enforced mandatory applicable laws

	Forest management by OFWE	Unplanned Conversion
Alternative land use	Forest under the OFWE's 9 branch enterprises	Wheat/barley
		Enset production
		Coffee production
		Maize production

The majority of unplanned forest conversion in all scenarios is technically illegal, but those legal requirements are weakly enforced for a variety of reasons and non-compliance is the norm across the majority of the reference area and the broader regions of Ethiopia in general and Bale Eco-region in particular. This is evident from an inspection of deforestation data for the historical baseline period. Strengthening law enforcement, providing incentives for legal compliance and access to legal alternatives to deforestation as a livelihood strategy are among the key elements of the proposed project.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

Since the REDD project generates no financial or economic benefits to the project proponents other than carbon market-related income, *Option II. Apply investment comparison analysis*

Sub-step 2b. – Option II. Apply investment comparison analysis

NPV is selected as the most suitable financial indicator to compare alternatives to implementing the project.

Data collection on costs and revenues, and financial analysis of the above mentioned alternative land-uses was conducted (supplementary material 31). The result of the analysis is summarized in Table 34 below.

Sub-step 2c. Calculation and comparison of financial indicators

Forest conservation is not financially viable without carbon benefit

The investment analysis clearly shows that for both forests (Dry and Moist Evergreen forests) returns from forest conversion into agriculture is greater than the financial benefits obtained from forest based uses or forest conservation (Table 23). For instance, at 15% discount rate the NPV of financial return obtained from Moist Evergreen forest conversion into Coffee provides about six fold greater than the NPV obtained from honey production and timber harvesting combined. For the dry forest as well the NPV of Enset production is by far greater than the forest based use.

Therefore, under current level of forest use and market *forest conservation is not financially viable without carbon benefit*, and if the project fails to realize conversion of the forests into the alternative land-uses is inevitable. The financial model underpinning this analysis is available for review by validator.

Table 23. Comparative financial analysis (NPV) on per year and hectare basis from credible land use alternatives and forest land use in the Bale Mountains Eco-region under various discount rates.

Land use alternative	Products	Dry forest case			Moist forest case		
Forest use		NPV@5 %	NPV@10 %	NPV@15 %	NPV@5 %	NPV@10 %	NPV@15 %
	Honey	881	881	881	881	881	881
	Timber	881	881	881	881	881	881
	Total						

	forest	47987	32921	21341	84326	69281	57298
Alternative land use (agriculture)	Enset				16659	13112	10454
	Coffee				3520	3520	3520
	Maize	11315	11315	11315			
	Wheat	11690	11690	11690			
	Barely	881	881	881	881	881	881

Sub-step 2d. Sensitivity analysis

If deforestation projected in the baseline scenario were to take place, the total loss from forest based return would be approximately US\$ 17.5 million for the moist evergreen forest and US\$ 1.9 million for the dry evergreen forest over the 20 years period. If the moist forest projected to be deforested under the baseline scenario were used for crop production, the benefits of clearing would be:

- ✓ US\$ 496,388,053.25 over 20 years when discounted at 15 %, if the land is used for Enset production
- ✓ US\$ 90,011,727.44 over 20 years when discounted at 15%, if the land is used for coffee production
- ✓ US\$ 30,309,557.86 over 20 years when discounted at 15%, if the land is used for maize production

Similarly, if the dry forest projected to be deforested under the baseline scenario were used for crop production, the benefits of clearing would be:

- ✓ US\$ 46,569,420.91 over 20 years, if the land is used for Enset production
- ✓ US\$ 24,690,597.56 over 20 years, if the land is used for wheat production
- ✓ US \$ 25,508,889.57 over 20 years, if the land is used for Barley production

Conclusion of Step 2: The investment analysis clearly indicates that the project activities, without additional revenues from sale of carbon credits (scenario 1), are less attractive than the baseline scenario.

Step 3. Barrier analysis

Not applied due to the application of investment comparison analysis (step 1 and 2)

Step 4. Common practice analysis

Many forest areas in Ethiopia, including large parts of the BMERP area, receive little active protection. The forest management is often associated with the presence of some NGO working in partnership with government

However, there are essential differences between such activities and the proposed BMERP project in scope on spatial, temporal and financial scales. No existing projects achieve full spatial coverage and address all key threats with sustainable funding over a period of decades. The norm for conservation projects in the country is to achieve partial coverage with limited capacity to address only some key threats. Funding for these projects is dependent on short-term (1-3 year) donor funding cycles.

The REDD project is clearly distinct from these similar, 'common practice' conservation activities based on the following components:

1. Greatly increased, sustained financing, commensurate with the scale and duration of the threats facing the site, in particular for law enforcement activities.
2. Direct linkage of project success to further revenue, ensuring a sustained long term focus on achieving measurable emissions reductions.
3. Creation of a new conservation-based revenue stream for the Bale Ecoregion increasing the level of long-term political support for protection of the forests.

The scale and nature of project activities to reduce deforestation are not common practice in the region, and what limited activity is taking place is essentially different as much as it is not linked formally to measurable commitments to reduce deforestation.

Summary:

In the absence of the REDD+ project activities and associated revenues, the Bale Mountains Eco-region potentially have two alternative land-use scenarios: 1) Forest conservation with costs assumed by the OFWE and Forest Cooperatives or by a dramatic upsurge in public support or 2) Deforestation for conversion to agriculture (baseline).

- These alternative scenarios are characterized by weak or nonexistent application of relevant laws and regulations.
- Without carbon revenues, forest conservation and implementation of proposed project activities is not economically attractive as compared to the baseline scenario.
- Improved governance and public funding, on the scale required to execute project activities, is constrained by institutional barriers as well as social conditions. The baseline scenario is unconstrained by these barriers – and is in fact driven by this lack of governance and social pressures.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Project Scale and Estimated GHG Emission Reductions or Removals

Project	
Large project (The BMERP generates greater than 1,000,000 tCO ₂ e per year that it is considered to be a large project)	Y

Table 24. Estimated GHG emission reductions or removals (tCO₂e)

Project year t	Estimated GHG emission reductions or removals (tCO ₂ e) tCO ₂ -e/yr
2012	1159028.68
2013	1136938.74
2014	1115678.86
2015	1095207.43
2016	1075455.16
2017	1373330.63
2018	1349414.37
2019	1326324.90
2020	1304008.16
2021	1282378.08
2022	1030872.74
2023	1481347.84
2024	1457421.39
2025	1434206.99

2026	1411721.87
2027	1389882.28
2028	1368666.03
2029	1348068.18
2030	1327987.74
2031	1308481.34
Total estimated Emission Reduction (ERs) (tCO2-e)	25776421.40
Total number of crediting years	20 years
Average annual ERs (tCO2-e)	1288821.07

5.2 Leakage Management (CL3.2)

The designed leakage management activities listed below and project activities planned are expected to address all the possible displacement of deforestation due to the project into the leakage belt. However, if there will be significant displacement observed above the baseline scenario *ex post* monitoring will reveal the quantity of GHG emission increased into the leakage belt which can be deducted from the project claimed emission reduction credits

There will not be any greenhouse gas emission increase expected outside the boundaries of the project area (leakage). Most of the project activities detailed in table 4 is mainly implemented in the leakage management area as well as in the project area as identified by the project proponent and relevant stakeholders. The activities implemented in the leakage management area are in partnership with the agents of the drivers of deforestation.

The activities planned to be implemented in the leakage management area/s to avoid leakage are:

- 1. Agricultural intensification and provision of economic alternatives to ensure the well-being of local communities:** This activity is implemented as part of intensifying agricultural activities to avoid the expansion of agricultural land into forest. The major activities will be support annual individual kebele-level performance grants; support livestock and range management measures; support poultry farming activities; support improved cereals and fruit tree crop activities;
The expected outcomes of such activities implementation are Increase productivity of agricultural and decrease forest encroachment. Deforestation and forest degradation decreases rural community household income increased;
- 2. Provision of alternative fuel wood and construction poles supply from non-forest lands:** This is to avoid the continuous cutting of trees from the REDD+ project area for the purpose of community fuelwood consumption and for house construction. The project is planning to closely work with rural households to establish plantations, assist establishment of community woodlots, improved stoves dissemination to satisfy the fuelwood and construction wood demand.

The distribution of the fuel efficient cookstoves is mainly to reduce the amount of fuel consumption by rural and urban households in and surrounding the REDD+ project areas. The distribution of the cookstove will be in the leakage management area surrounding the project area/s. 12,000 Cook stoves has been distributed which reduces the use of the wood by 50%.

- 3. Implementation of Sustainable Forest management and strengthening enforcement of policies and laws:** This is to support and strengthen PFM cooperatives, enhanced forest patrols to reduce illegal activities; implement forest fire prevention activities. The existing forest law will be enforced against illegal expansion of agricultural land into forest to avoid activity leakage in to the leakage belt.

5.3 Baseline emissions (CL3.1)

Step 4: Projection of future deforestation

4.1. Projection of the quantity of future deforestation (Step 4.1 of VM0015, v1.1)

Selection of baseline approach: Due to a paucity of ground data at a resolution that could be related to the small-scale mosaic deforestation exhibited in this region, it was not possible to generate a reliable linear or logistic regression for predicting the quantity of future deforestation. However, analysis presented in the methodological annex indicates an increasing rate of deforestation in the region over the historical time period. As it is likely the future deforestation rate continue to accelerate, yet the analysis of the agents and drivers has not provided conclusive evidence as to how much, the methodology recommends using an historical average approach.

Quantitative projection of future deforestation: This methodology suggests stratifying the area based on differences in agents of deforestation; however, the agents acting are present throughout the reference region. Based on the historical land-use and land-cover change analysis (detailed in the Methodological Annex) a historical rate for each forest strata were estimated, using an historical reference period of 2000-2011 (Table 25; table 8 of the methodology-VM0015, v1.1, Table 8). Therefore, there was a decision to stratify the baseline by forest type due to their differing rates of deforestation and differences in access by agents.

Table 25. Stratification of the reference region into forest types (Table 8, VM0015, V1.1).

Stratum ID		Description	Area at year in ha (projected deforested area from 2012-2031)																			
ID_i	Name		1 (2012)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20 (2031)
1	Dry forest	This forest stratum covers an area of 109892 and is subject to the annual deforestation rate of 6.6%	7055.5	6602.5	6178.6	5781.9	54101.7	5063.3	4738.2	4434	4149.3	3882.9	3633.6	3400.3	3182	2977.7	2786.5	2607.6	2440.2	2283.5	2136.9	1999.7
2	Humid forest	This forest stratum covers an area of 448379 ha, and is subject to the annual deforestation rate of 1.1%	5068.4	5011.1	4954.4	4898.4	4843.1	4788.3	4734.2	4680.7	4627.8	4575.4	4523.7	4472.6	4422	4372	4322.6	4273.8	4225.5	4177.7	4130.5	4083.8

Projection of the annual areas of baseline deforestation in the reference region: For the historical average approach the methodology recommends using the following equation:

$$ABSLRR_{i,t} = ARR_{i,t-1} * RBSLRR_{i,t} \dots\dots\dots \text{equation2}$$

Where,

- $ABSLRR_{i,t}$ annual area of baseline deforestation in stratum i with the reference region at year t (in ha yr⁻¹),
 $ARR_{i,t-1}$ area with the forest cover in stratum i within the reference region at year $t-1$ (ha) and
 $RBSLRR_{i,t}$ deforestation rate applicable to the stratum i within the reference region at year t (%).

Therefore, the average rates for each stratum over the historical period 2000-2011 were used for projecting the baseline over the 20-year crediting period. VM Table 9a presents baseline deforestation in the reference region for the time period 2012-2031.

Projection of annual areas of baseline deforestation in the project area and leakage belt

Using that same rate and the proportion of deforestation modelled to occur in the leakage belt and project area for 2031, an estimate of annual forest area lost is presented for those two subsets of the reference region (see table 26, 27 & 28).

Table 26. Annual areas of baseline deforestation in the reference region (Table 9.a. VM0015, v1.1.)

Project year t	Stratum i in the reference region		Annual Forest Combined Ha	Total Cumulative Forest Combined Ha
	1 Dry Forest Ha	2 Moist Forest Ha		
2012	7055.5	5068.4	12123.9	12123.9
2013	6602.5	5011.1	11613.6	23737.4
2014	6178.6	4954.4	11133	34870.5
2015	5781.9	4898.4	10680.3	45550.8
2016	54101.7	4843.1	10253.7	55804.6
2017	5063.3	4788.3	9851.6	65656.2
2018	4738.2	4734.2	9472.4	75128.6
2019	4434	4680.7	9114.7	84243.2
2020	4149.3	4627.8	8777.1	93020.3
2021	3882.9	4575.4	8458.4	101478.7
2022	3633.6	4523.7	8157.4	109636
2023	3400.3	4472.6	7872.9	117509
2024	3182	4422	7604.1	125113
2025	2977.7	4372	7349.8	132462.8
2026	2786.5	4322.6	7109.2	139571.9
2027	2607.6	4273.8	6881.4	146453.3
2028	2440.2	4225.5	6665.7	153119
2029	2283.5	4177.7	6461.2	159580.2
2030	2136.9	4130.5	6267.4	165847.6
2031	1999.7	4083.8	6083.5	171931.2

Table 27. Annual areas of baseline deforestation in the project area (Table 9.b. VM0015, v1.1)

Project year t	Stratum i in the reference region in the project area		Annual Forest Combined Ha	Total Cumulative Forest Combined Ha
	1 Dry Forest Ha	2 Moist Forest Ha		
2012	1225.1	4016.5	5241.6	5241.6
2013	1146.4	3971.1	5117.5	10359.1

2014	1072.8	3926.2	4999	15358.1
2015	1004	3881.8	4885.7	20243.8
2016	939.5	3837.9	4777.4	25021.2
2017	879.2	3794.5	4673.7	29694.9
2018	822.7	3751.6	4574.4	34269.3
2019	769.9	3709.2	4479.1	38748.5
2020	720.5	3667.3	4387.8	43136.2
2021	674.2	3625.8	4300.1	47436.3
2022	990.1	2058.8	3048.6	50484.9
2023	611.9	3414.8	4026.7	54511.6
2024	572.6	3376.2	3948.8	58460.4
2025	535.8	3338	3873.9	62334.3
2026	501.4	3300.3	3801.7	66136
2027	469.2	3263	3732.2	69868.3
2028	439.1	3226.1	3665.2	73533.3
2029	410.9	3189.7	3600.6	77134.1
2030	384.5	3153.6	3538.1	80672.2
2031	359.8	3118	3477.8	84150

Table 28. Annual areas of baseline deforestation in the leakage belt (Table 9.c. VM0015, V1.1.)

Project year <i>t</i>	Stratum <i>i</i> in the reference region in the leakage belt			Total
	1 <i>Dry Forest</i> Ha	2 <i>Moist Forest</i> ha	Annual <i>Forest Combined</i> ha	Cumulative <i>Forest Combined</i> ha
2012	978.3	1051.9	2030.2	2030.2
2013	915.4	1040	1955.5	3985.6
2014	856.7	1028.3	1884.9	5870.5
2015	801.7	1016.6	1818.3	7688.8
2016	750.2	1005.1	1755.3	9444.2
2017	702	993.8	1695.8	111400
2018	657	982.5	1639.5	12779.5
2019	614.8	971.4	1586.2	14365.7
2020	575.3	960.5	1535.8	15901.5
2021	538.4	1015.2	1553.5	17455
2022	673.3	1069.9	1743.2	20528
2023	481.6	1057.8	1539.4	22067.4
2024	450.7	1045.8	1496.5	23563.9
2025	421.7	1034	1455.7	25019.6
2026	394.7	1022.3	1417	26436.6
2027	369.3	1010.8	1380.1	27816.6
2028	345.6	999.3	1344.9	29161.6
2029	323.4	988	1311.5	30473
2030	302.7	976.9	1279.5	31752.6
2031	283.2	965.8	1249	33001.6

Projection of location of future deforestation under baseline scenario

Preparation of factor maps: The project decided to use the “empirical approach” for creating the factor maps; whereby, variables were divided into distance or density classes in order to generate separate relationships for each class. Based on knowledge of the region, availability of data and first order sensitivity analysis, the variables considered to be the most important for modeling deforestation are listed in Table 29.

Table 29. Factor maps used to generate deforestation risk maps (**Table 10. VM0015, v1.1**)

Factor Map		Source	Variable represented		Meaning of the categories or pixel value		Other Maps and Variables used to create the Factor Map		Algorithm or Equation Used	Comments
ID	File Name		Unit	Description	Range	Meaning	ID	File Name		
1	Settlements	OFWE	Settlement km ⁻²	Density	0-50	Density	NA	NA	NA	To capture the impact of greater pressure due to the proximity to several settlements
2	Roads	OFWE	Slope* distance (km)	Slope cost distance	0-290,000	Distance including slope effect	7	Slope	ArcGIS cost distance	
3	Protected Area	OFWE	Classes	Protected area	1- protected 2- not	Classes of protection	NA	NA	NA	
4	Natural Coffee Area	Bale REDD+ experts	Classes	Natural coffee area	1- coffee area 2-not	Presence of natural coffee	6 & 7	Slope & elevation	Humid forest, slope (0-15) & elevation (1350-1550)	Assumed it would be unlikely to be deforested.
5	Distance to deforestation	Dinamica	Meters	Direct distance from deforestation	250-10,000	Distance in meters		Land cover maps	Dinamica creates this map iteratively	250 meter is the smallest unit due to the resolution of imagery used for modeling.
6	Elevation	SRTM	Meters	Elevation	0-4300	Meters	NA	NA	NA	NA
7	Slope	SRTM	Degrees	Slope	0-70	Degrees	6	Elevation	Derived in ENVI	
8	Population Growth	Census (1994 & 2007)	% growth	Growth	-5%-60%	Percent Growth		Population Density data	See Equation 3	

Population growth rate was derived from the following equation:

$$PGR = \frac{\ln(P(t_2)) - \ln(P(t_1))}{(t_2 - t_1)} \quad \text{.....equation3}$$

Where,

t_2 is the final year,

t_1 is the initial year, and

P represents the population measured at t_2 or t_1 .

Factor maps used for modelling deforestation

Figures 29-50 present the final “factor maps” used for model generation. For each map weights of evidence are presented for humid and dry forest separately. Values that are above zero indicate a positive influence on deforestation occurrence.

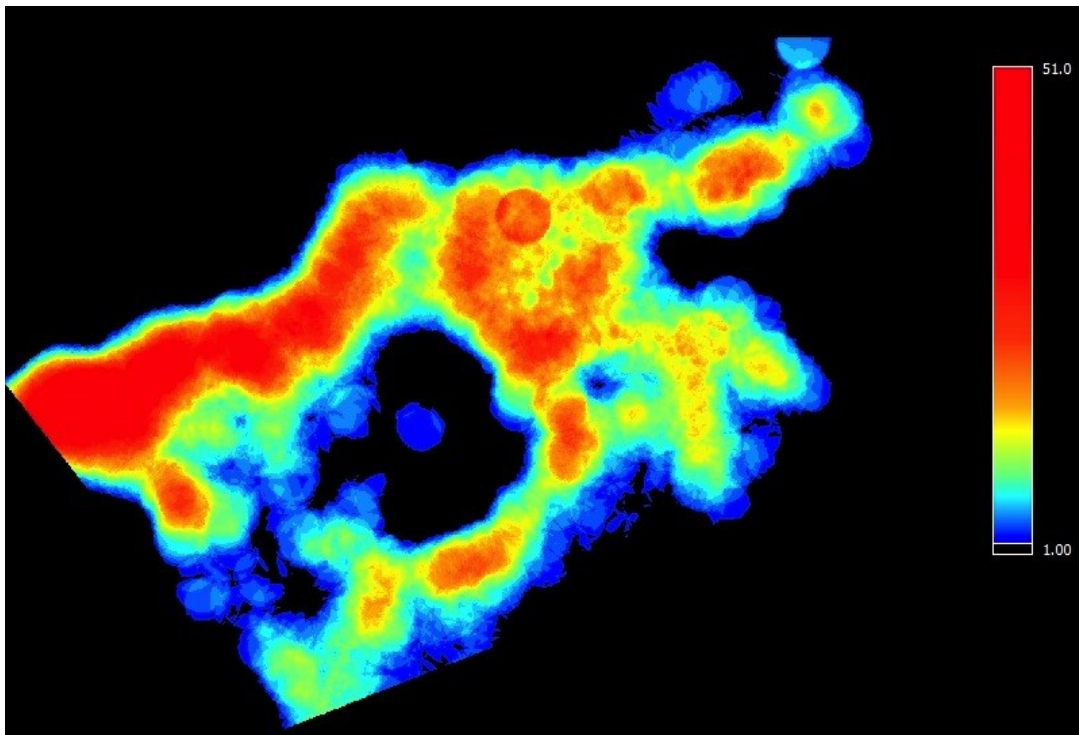


Figure 29. Density of settlements for the reference region.

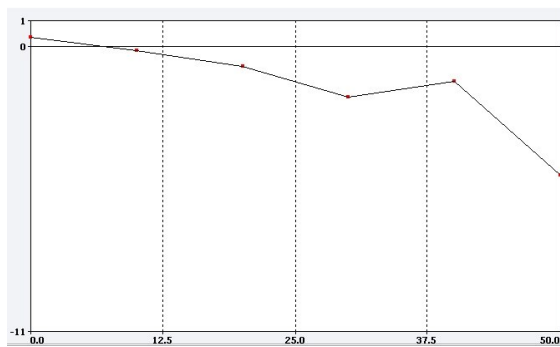


Figure 30. Weights of evidence for dry forest and density of settlements

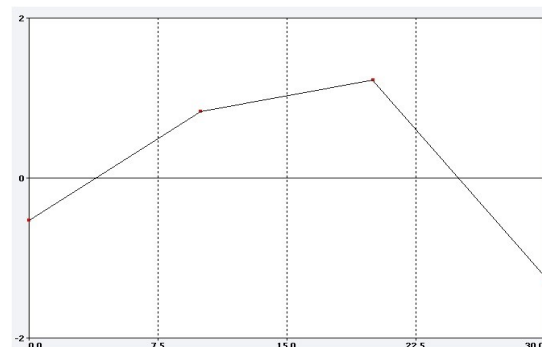


Figure 31. Weights of evidence for humid forest and density of settlements

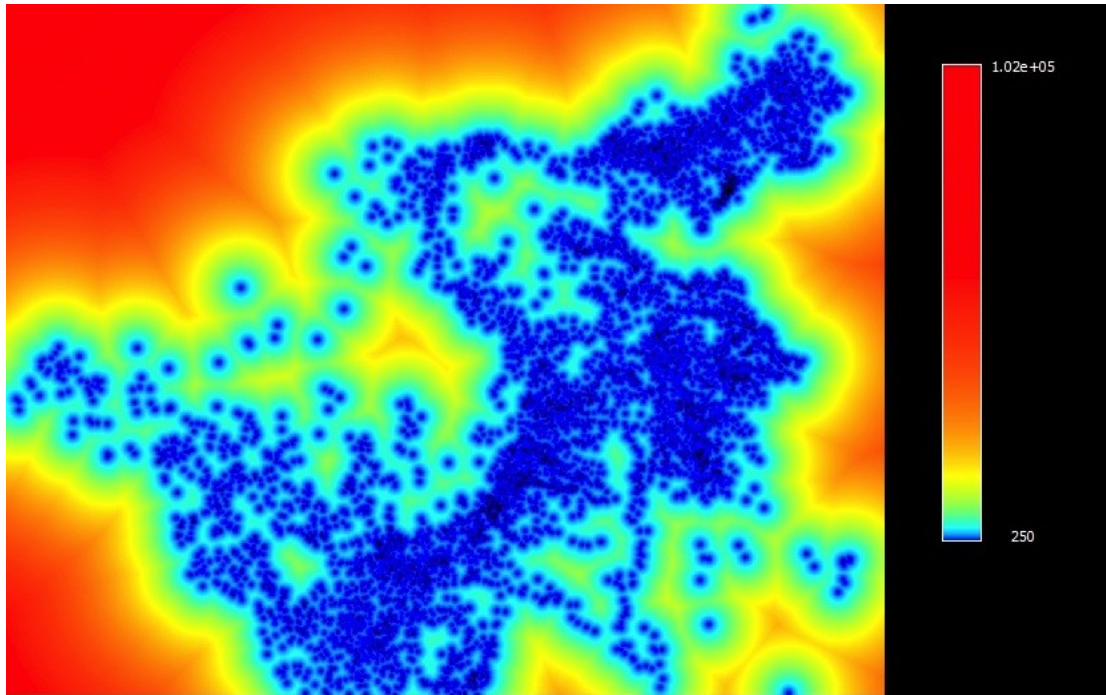


Figure 32. Distance from deforestation for the reference region.

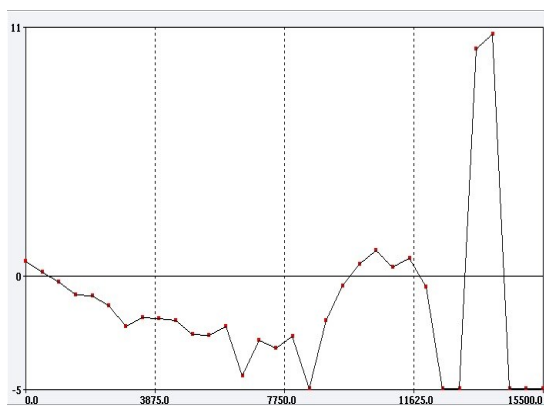


Figure 33. Weights of evidence for dry forest and distance to deforestation.

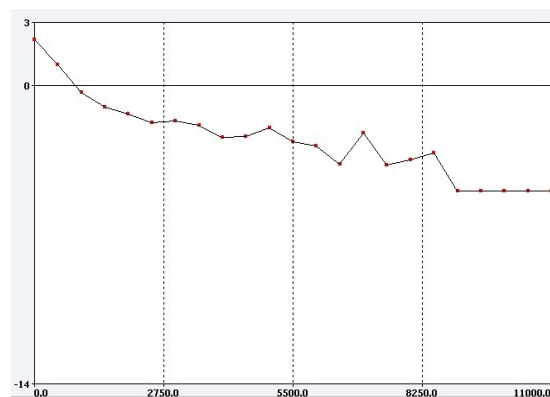


Figure 34. Weights of evidence for humid forest and distance to deforestation

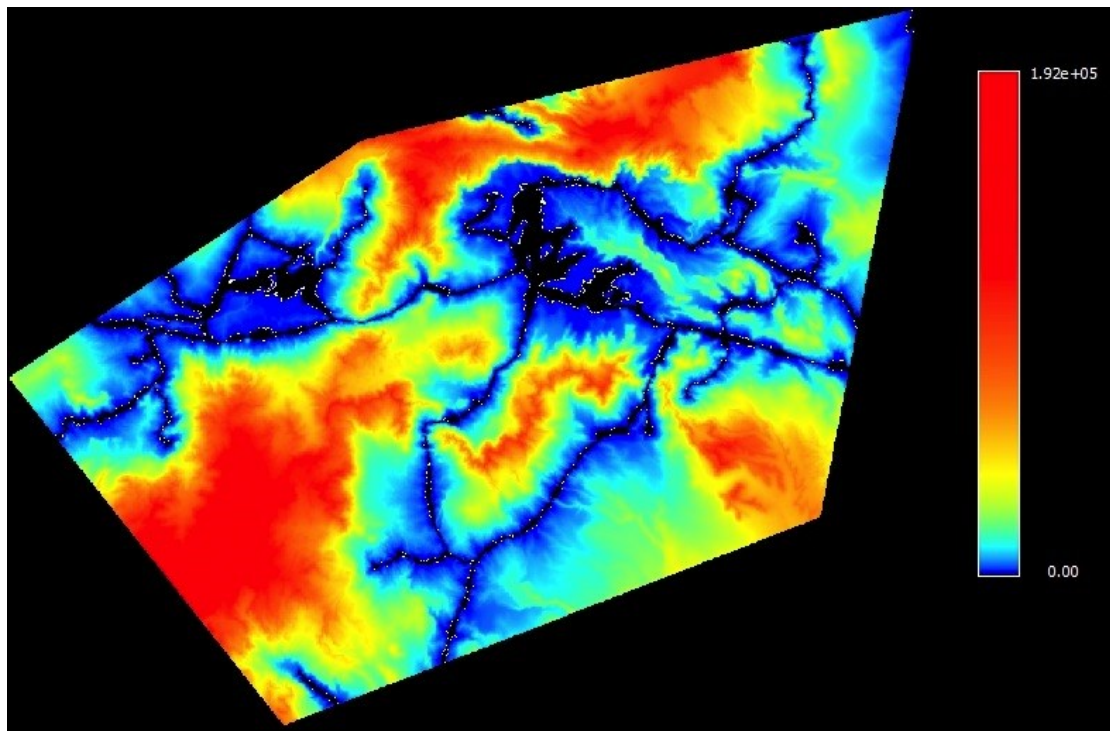


Figure 35. Slope cost distance to all roads for the reference region. This layer was generated using ArcGIS cost distance with SRTM-derived slope as the cost surface.

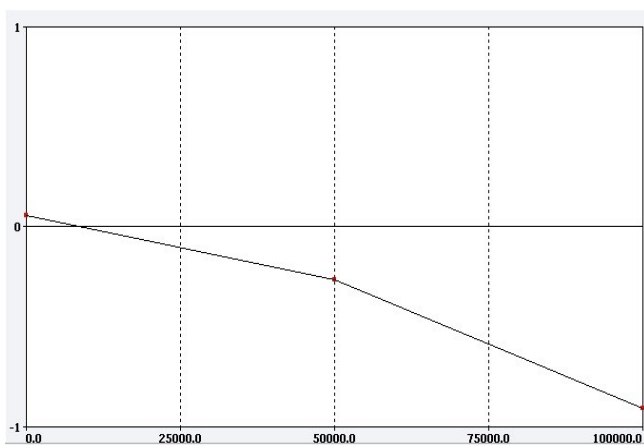


Figure36. Weights of evidence for dry forest and distance to roads.

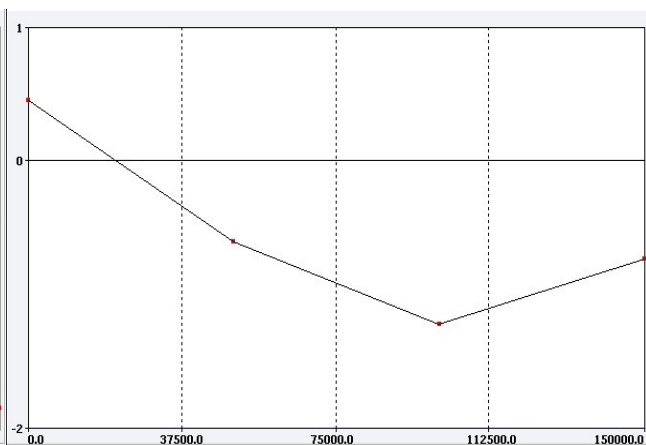


Figure 37. Weights of evidence for humid forest and distance to roads.

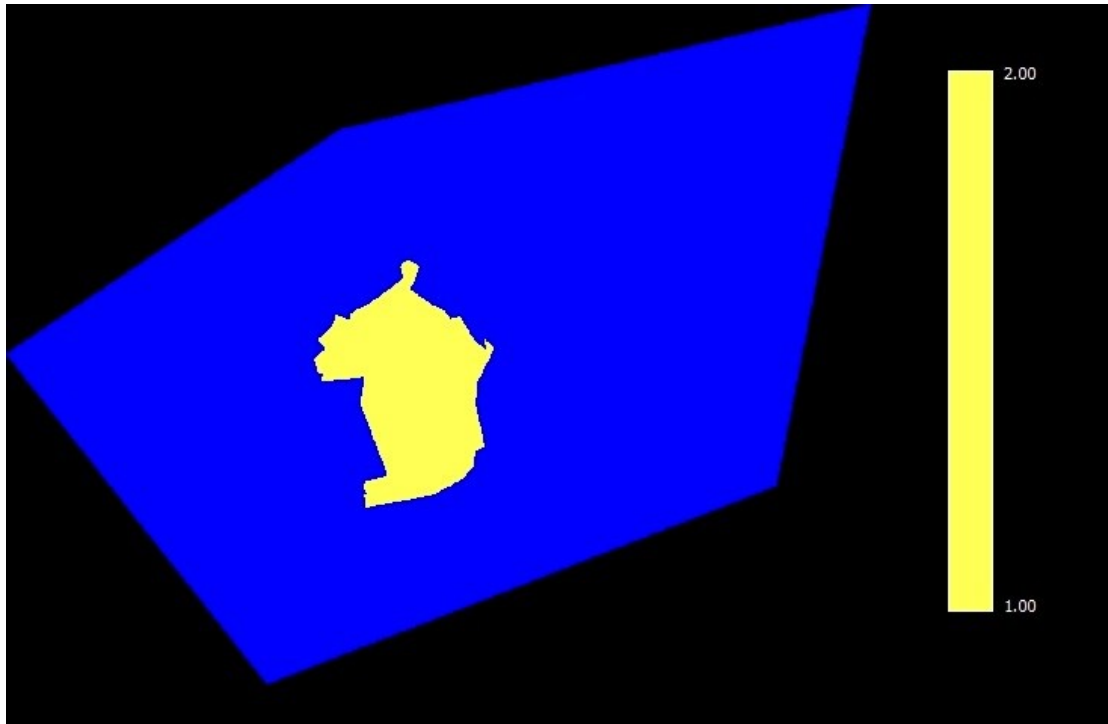


Figure 38. Protected area classification for the reference region.

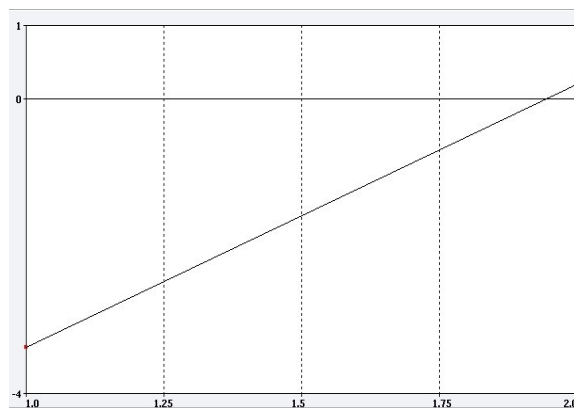


Figure 39. Weights of evidence for protected and unprotected humid forest.

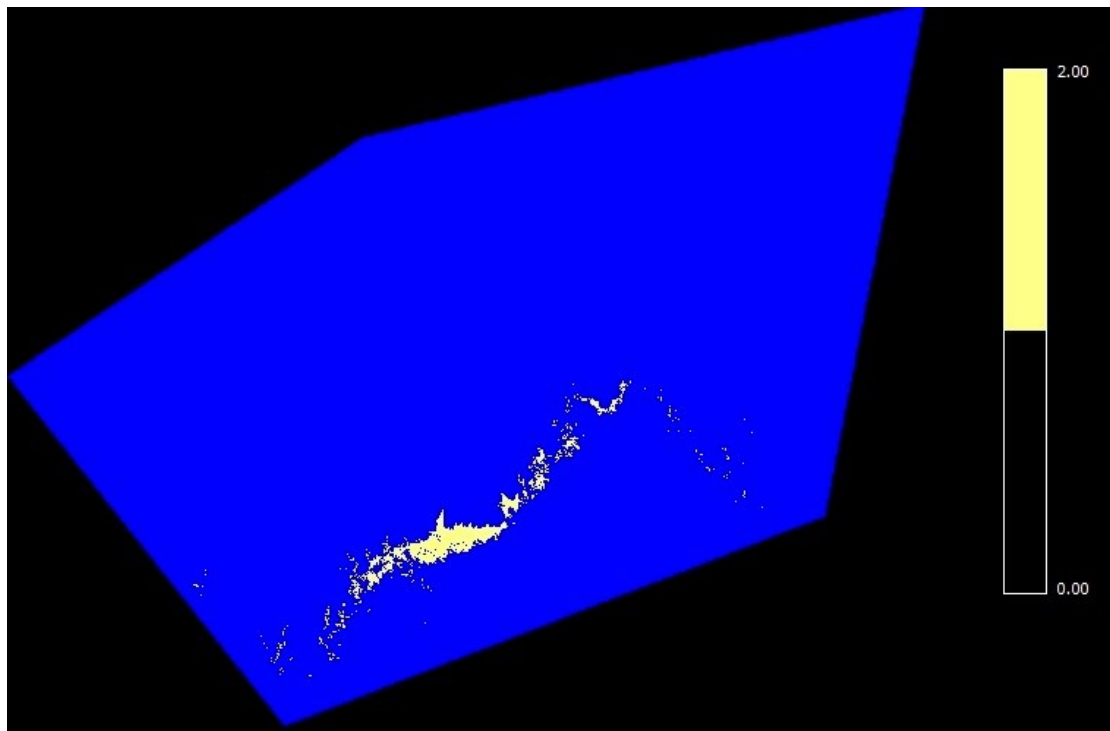


Figure 40. Coffee area classification for reference region. This layer was generated using ENVI's decision tree classification tool where areas with humid forest cover, less than 15° slope and between the elevations 1350 and 1550.

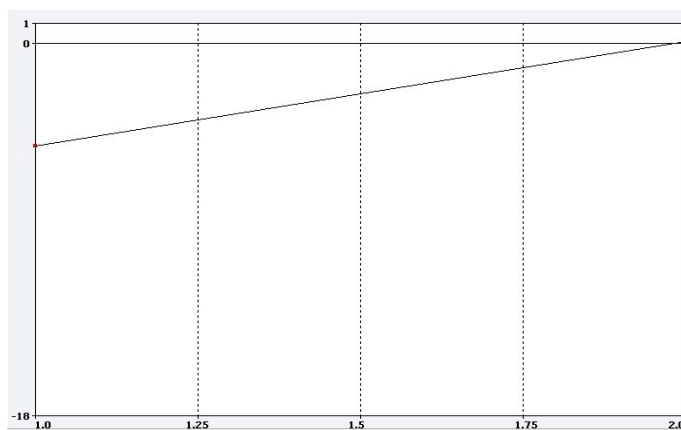


Figure 41. Weights of evidence for humid forest and natural coffee areas.

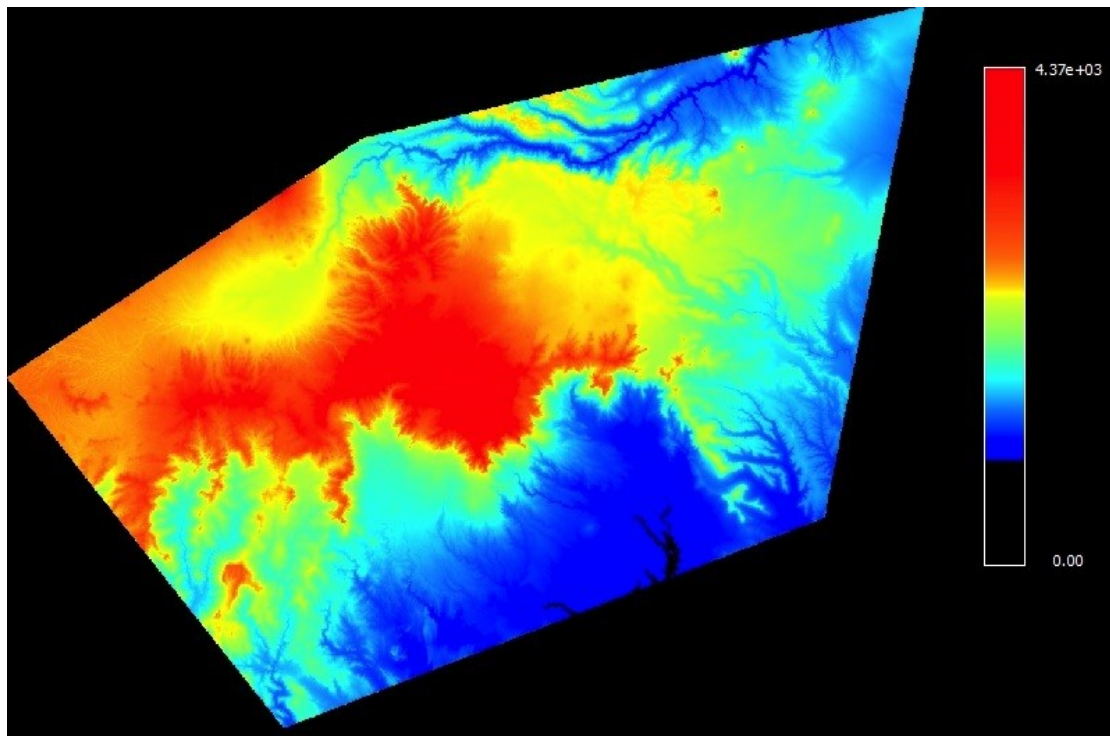


Figure 42. Digital elevation model (DEM) from SRTM for reference region.

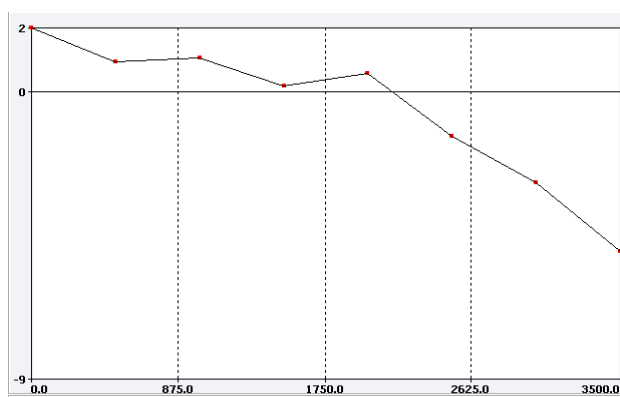


Figure 43. Weights of evidence for dry forest and elevation.

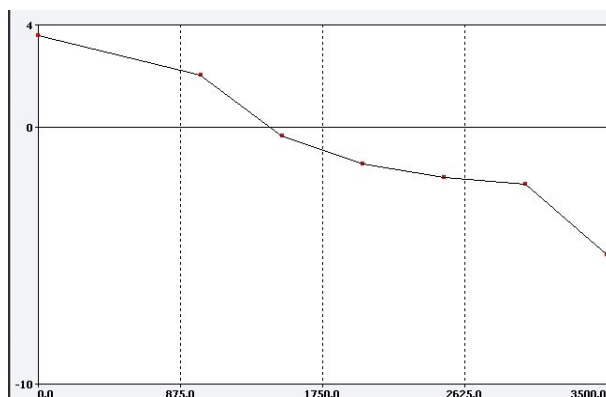


Figure 44. Weights of evidence for humid forest and elevation.

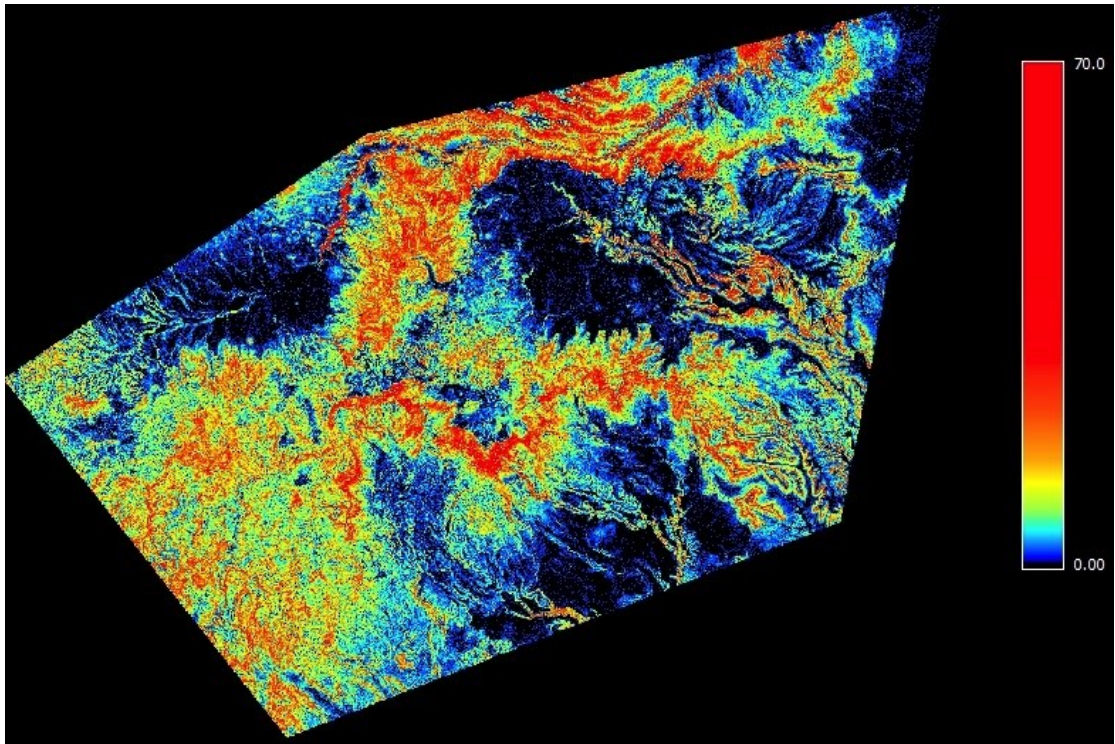


Figure 45. Slope layer for reference region.

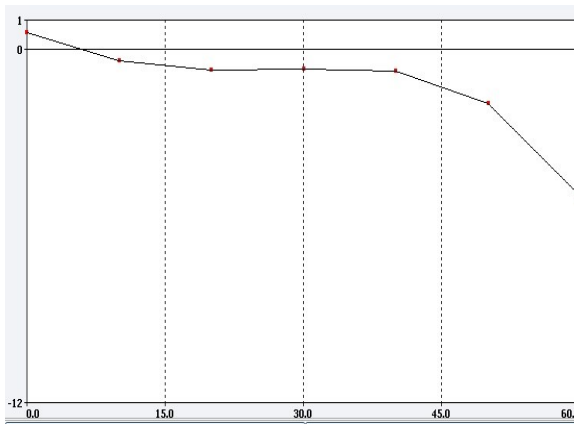


Figure 46. Weights of evidence for dry forest and slope.

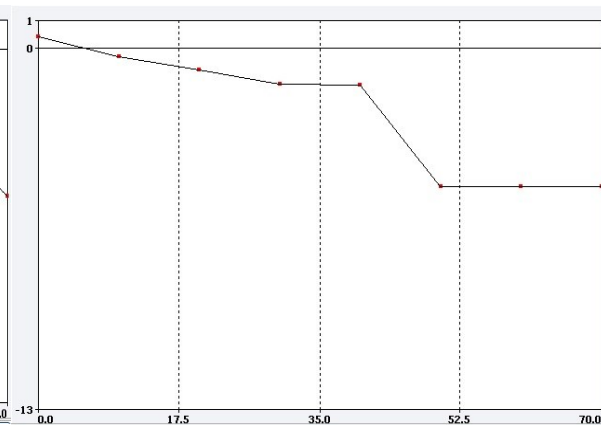


Figure 47. Weights of evidence for humid forest and slope.

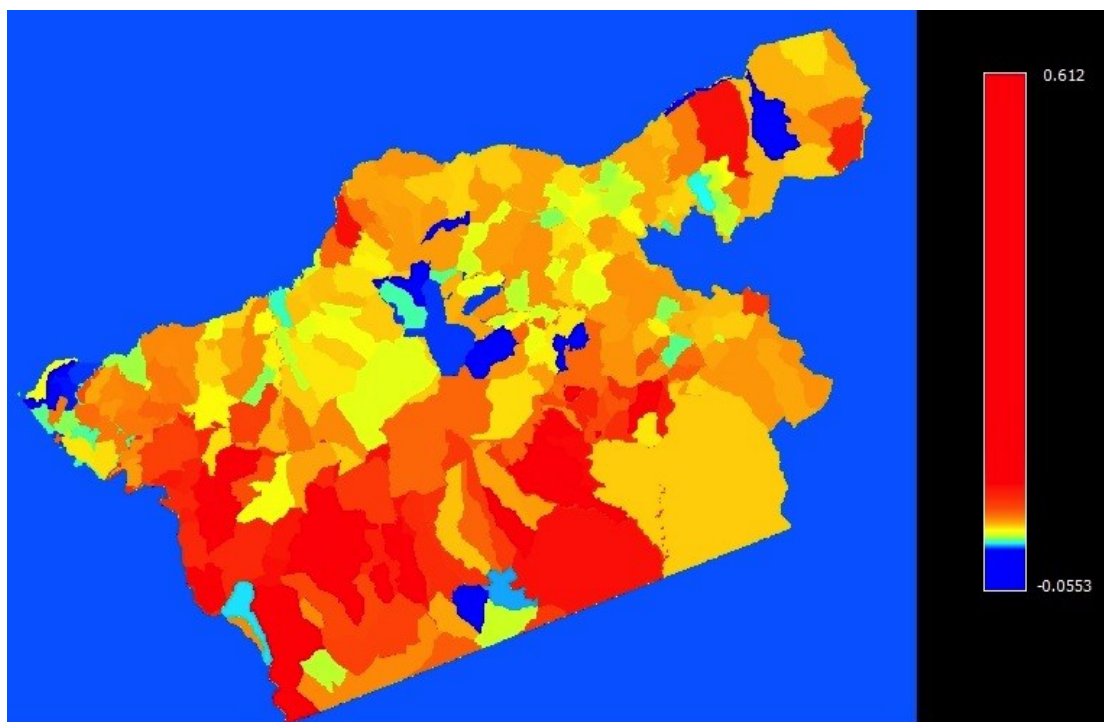


Figure 48. Population growth estimates at the kebele or wereda level, depending on data availability. Generated from 1994 and 2007 census data.

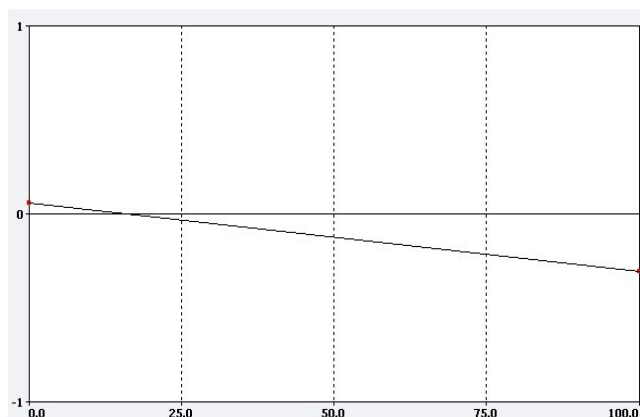


Figure 49. Weights of evidence for dry forest and population growth.

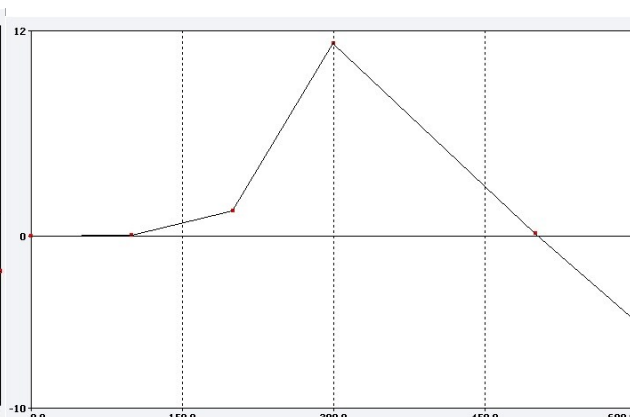


Figure 50. Weights of evidence for humid forest and population growth.

Selection of the most accurate deforestation risk map

Figure 51. Presents a flowchart of how a deforestation risk map and projected deforestation maps are generated in Dinamica. The main inputs to the model are the factor maps presented above (as “static variables”) and change detection maps created from original land-cover maps. The weights of evidence, presented above, are generated in the “modeling” step and are used as direct inputs for the probability map. Transition rates are calculated separately and included as an input to the model. A distance to deforestation layer is generated for each iteration of the model from the previous step’s projected deforestation.

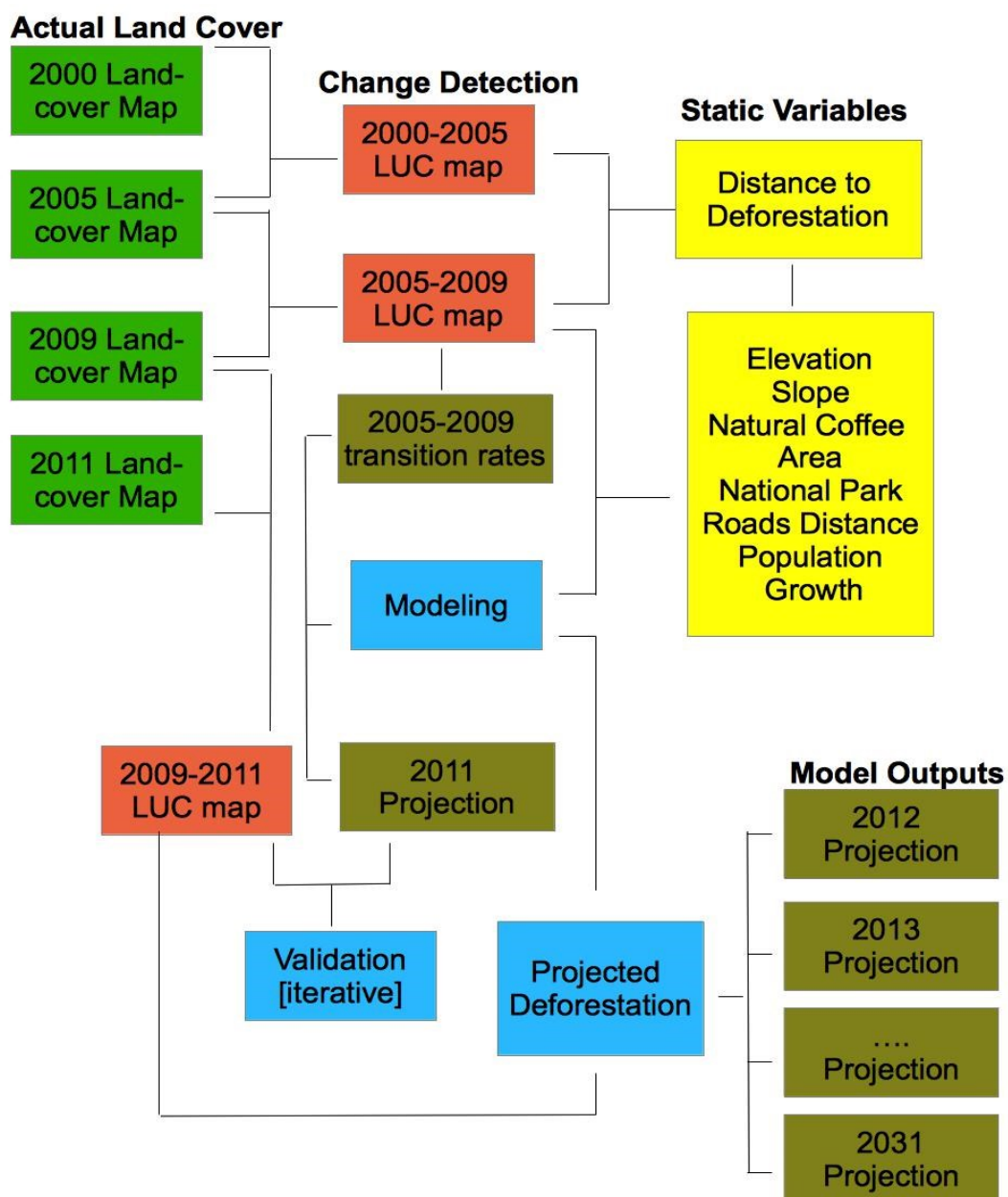


Figure 51. Flowchart of inputs for and running of the Dinamica EGO model including validation.

In order to generate the most reliable deforestation risk map, the derived land-use change model in Dinamica was run several times and the factor maps with the highest correlations were kept for the final land-use model (further description is provided in the Methodological LUC Annex). The deforestation risk map generated from the 2005-2009 period and run for the 2009-2011 time period is pictured below (see Figure 52).

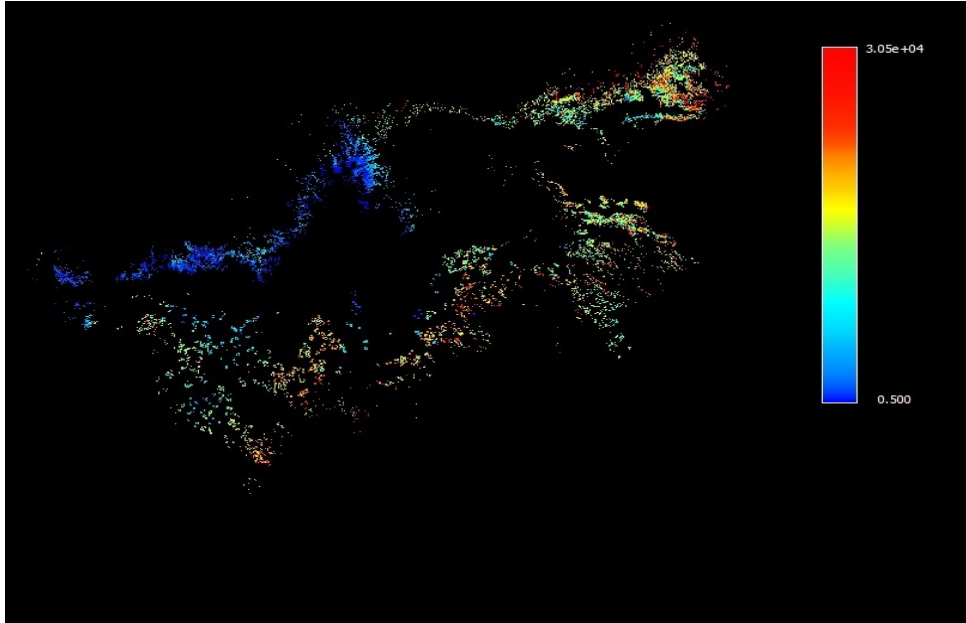


Figure 52. Final deforestation risk map generated for 2011, from the 2005-2009 derived model.

Validation of the baseline model

The overall accuracy of the model, assessed using a moving window approach, was only 30% for a 9-pixel window (see Figure 53).

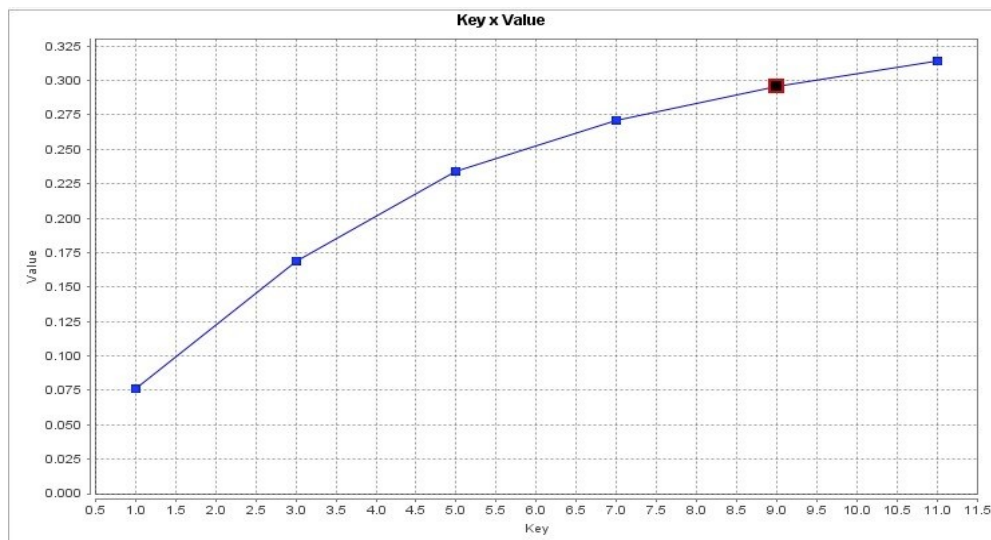


Figure 53. Moving window constant decay validation of location of predicted deforestation with observed deforestation for 2009-2011.

This poor predictive capability was not surprising, due to the small-scale and scattered nature of local deforestation and the occurrence of forest clearance far away from identified infrastructure and existing settlements (see Figure 54). The weights of evidence analysis revealed the strongest predictors of deforestation were ecological conditions like slope and distance to previous deforestation; however, it is evident that tiny patches of deforestation are occurring in addition to that relationship.

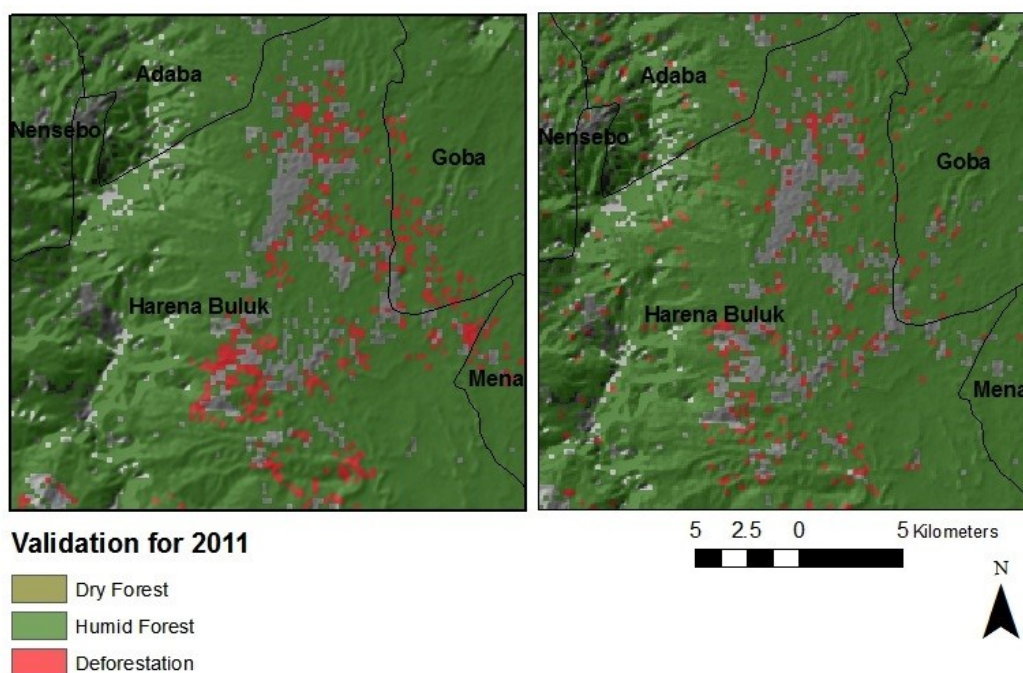


Figure 54. Comparison of modeled deforestation for the time period 2009-2011 (left) and observed deforestation (right).

Looking at each woreda separately, on the other hand, the model ranged in accuracy from only 4% for Sinana (an area of dense agriculture and little remaining forest) to 63% for Agarfa, for an 11-pixel window, indicating that some areas are more easily predicted than others. This analysis did also reveal the model performed above 40% for 6 of the woredas (e.g. Adaba, Agarfa, Dodola, Gololcha, Kokosa and Nensabo) (see Figure 55), some of which suffer from among the highest rates of forest loss.

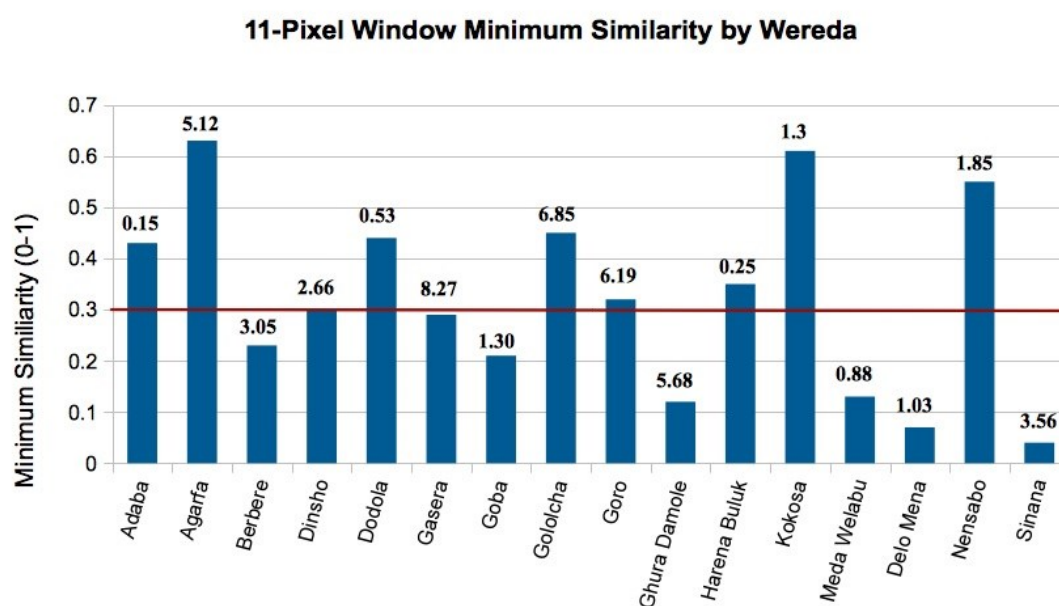
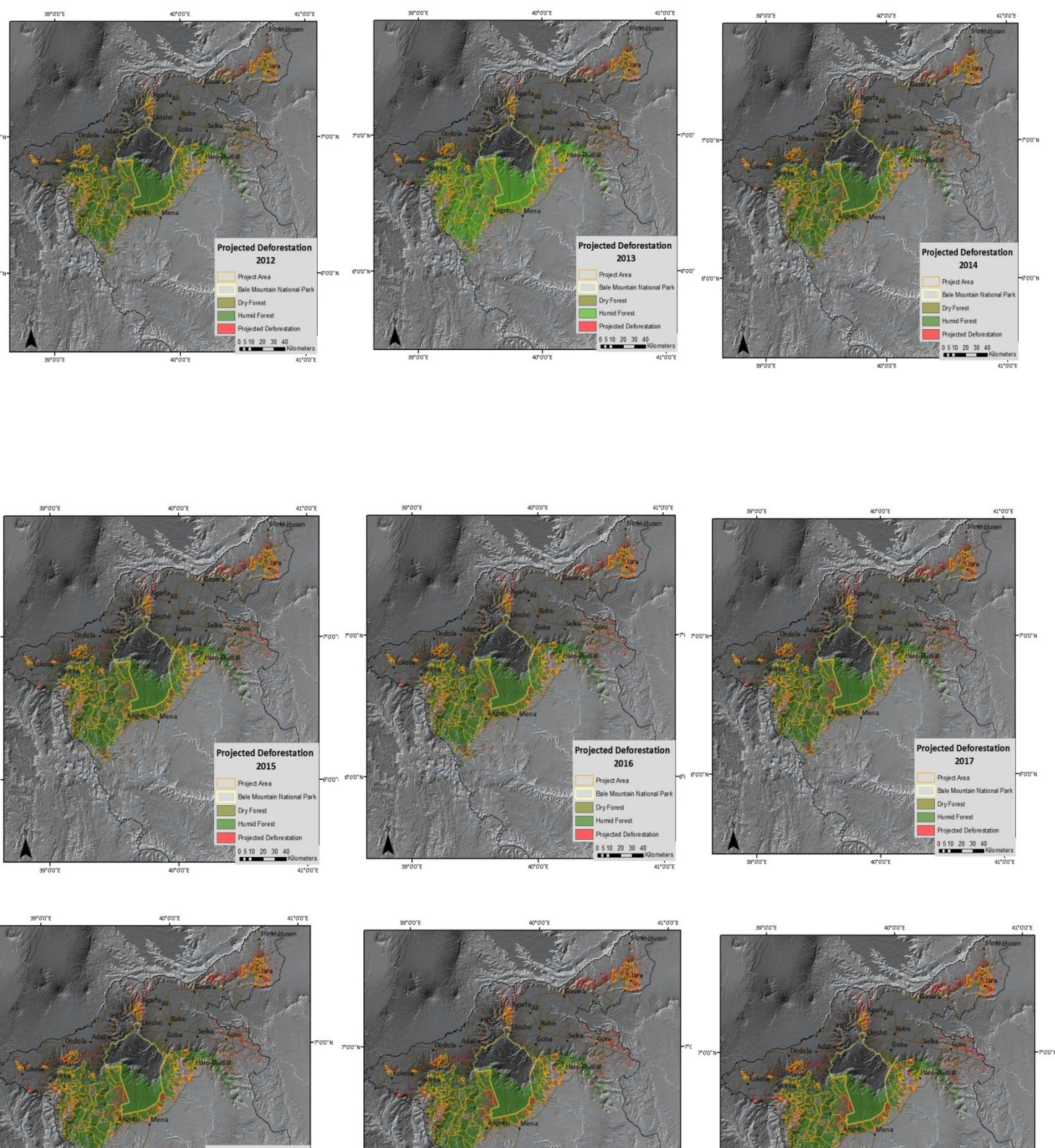
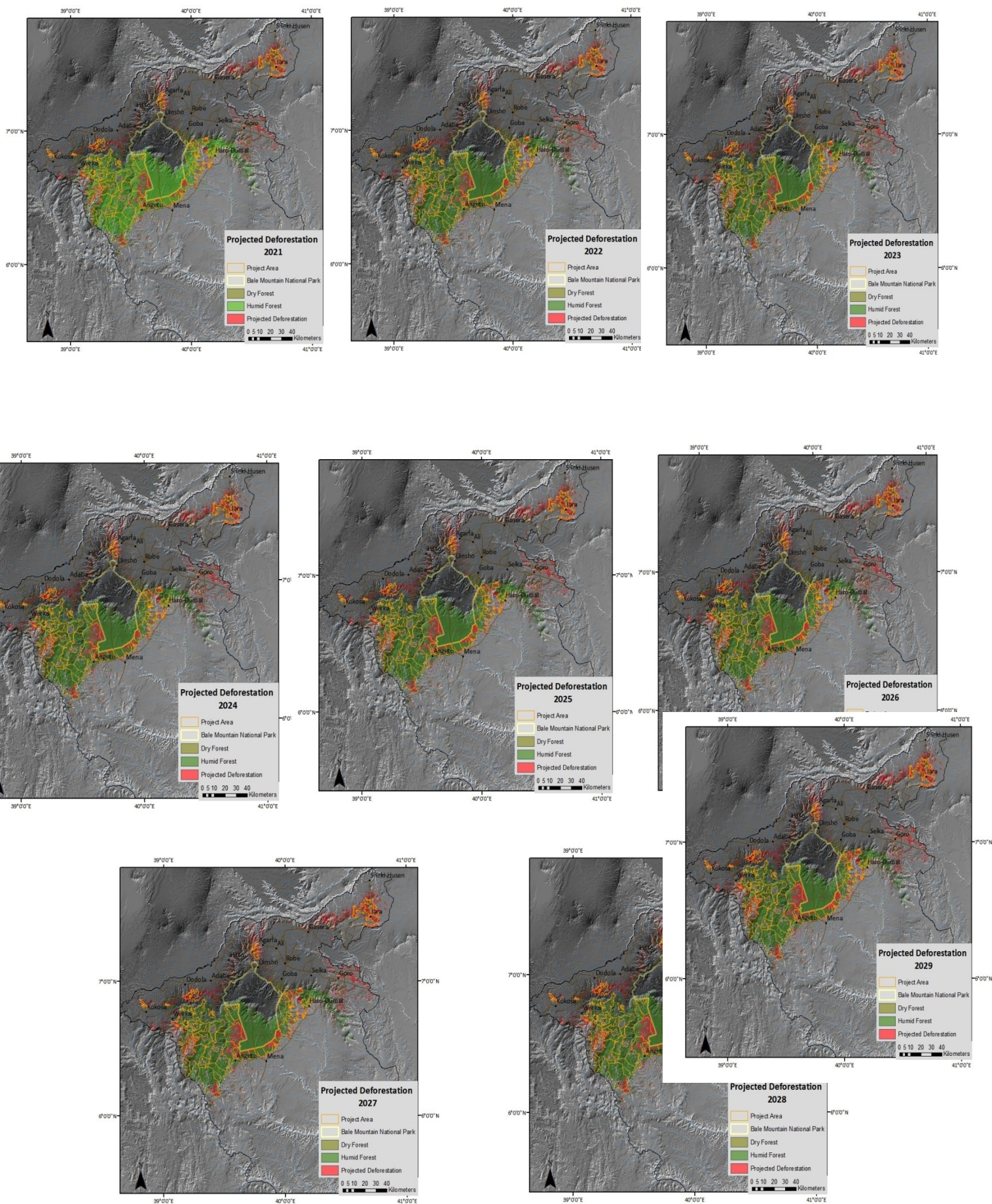


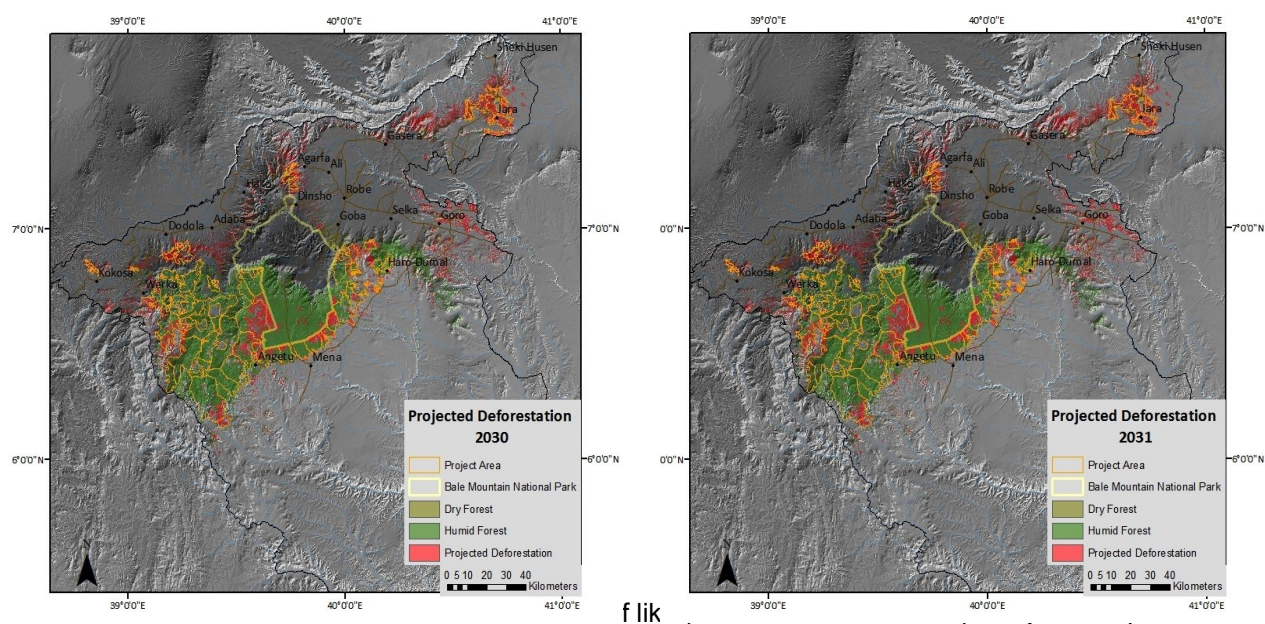
Figure 55. Accuracy assessments for modeled deforestation for each woreda, with estimated deforestation rates for the reference period included in bold.

Mapping of the locations of future deforestation

While the accuracy assessment revealed limitations of the model, it was considered useful for providing a reasonable estimate of the general location of deforestation. Using the model derived for the 2005-2009 time period and validated using the 2009-2011 observed deforestation, the Dinamica EGO model was run for 2012-2031. The 2011 benchmark map, with observed deforestation from 2009 was used as the initial time step. The rates estimated in the previous section were used to input the area of deforestation expected while the location was decided by the deforestation risk map generated by Dinamica for each time step. The proportion of deforestation occurring in the project area and leakage belt were derived from the final 2031 projection map and then applied for the previous years and presented in VM Tables 9b and 9c. The maps of projected annual areas of deforestation (Figure 56) are presented below:







each in supplementary material 12)

Step 5. Definition of the land-use and land-cover change component of the baseline

The goal of this step is to calculate the activity data of the initial forest classes that will be deforested and activity data of the post-deforestation classes that will replace them in the baseline case.

5.1. Calculation of baseline activity data per forest class

A set of maps was produced showing for each forest class which polygons would be deforested each year in the absence of the BMERP. On the other hand we estimated from the historical deforestation rate (which is also sets the reference level) hectares of each forest class that will be deforested in the reference region, the project area and the leakage belt. These are presented in tables 30, 31 and 32.

Table 30. Annual areas deforested per forest class *icl* within the reference region in the baseline case (baseline activity data per forest class) (table 11.a, VM0015, 1.1)

Project year <i>t</i>	Area deforested per forest class <i>icl</i> within the reference region		Total baseline deforestation in the reference region	
	1 <i>Dry Forest</i> Ha	2 <i>Moist Forest</i> Ha	<i>ABSLRR</i> Annual Ha	cumulative <i>ABSLRR</i> ha
2012	7055.5	5068.4	12123.9	12123.9
2013	6602.5	5011.1	11613.6	23737.4
2014	6178.6	4954.4	11133	34870.5
2015	5781.9	4898.4	10680.3	45550.8
2016	54101.7	4843.1	10253.7	55804.6
2017	5063.3	4788.3	9851.6	65656.2
2018	4738.2	4734.2	9472.4	75128.6
2019	4434	4680.7	9114.7	84243.2
2020	4149.3	4627.8	8777.1	93020.3
2021	3882.9	4575.4	8458.4	101478.7
2022	3633.6	4523.7	8157.4	109636
2023	3400.3	4472.6	7872.9	117509

2024	3182	4422	7604.1	125113
2025	2977.7	4372	7349.8	132462.8
2026	2786.5	4322.6	7109.2	139571.9
2027	2607.6	4273.8	6881.4	146453.3
2028	2440.2	4225.5	6665.7	153119
2029	2283.5	4177.7	6461.2	159580.2
2030	2136.9	4130.5	6267.4	165847.6
2031	1999.7	4083.8	6083.5	171931.2

Table 31. Annual areas deforested per forest class *ic/* within the project area in the baseline case (baseline activity data per forest class) (table 11.b. VM0015, 1.1)

Project year <i>t</i>	Area deforested per class within the project area		Total baseline deforestation in the project area	
	1 <i>Dry Forest</i> Ha	2 <i>Moist Forest</i> ha	ABSLPA 1,t annual Ha	ABSLPA Cumulative Ha
2012	1225.1	4016.5	5241.6	5241.6
2013	1146.4	3971.1	5117.5	10359.1
2014	1072.8	3926.2	4999	15358.1
2015	1004	3881.8	4885.7	20243.8
2016	939.5	3837.9	4777.4	25021.2
2017	879.2	3794.5	4673.7	29694.9
2018	822.7	3751.6	4574.4	34269.3
2019	769.9	3709.2	4479.1	38748.5
2020	720.5	3667.3	4387.8	43136.2
2021	674.2	3625.8	4300.1	47436.3
2022	990.1	2058.8	3048.6	50484.9
2023	611.9	3414.8	4026.7	54511.6
2024	572.6	3376.2	3948.8	58460.4
2025	535.8	3338	3873.9	62334.3
2026	501.4	3300.3	3801.7	66136
2027	469.2	3263	3732.2	69868.3
2028	439.1	3226.1	3665.2	73533.3
2029	410.9	3189.7	3600.6	77134.1
2030	384.5	3153.6	3538.1	80672.2
2031	359.8	3118	3477.8	84150

Table32. Annual areas deforested class *ic/* within the leakage belt in the baseline case (baseline activity data per forest class) [Table 11.c, VM0015, v1.1]

Project year <i>t</i>	Area deforested per class within the leakage belt		Total baseline deforestation in the leakage belt	
	1 <i>Dry Forest</i> ha	2 <i>Moist Forest</i> Ha	ABSLLB 1,t annual Ha	ABSLLB Cumulative Ha
2012	978.3	1051.9	2030.2	2030.2
2013	915.4	1040	1955.5	3985.6
2014	856.7	1028.3	1884.9	5870.5

2015	801.7	1016.6	1818.3	7688.8
2016	750.2	1005.1	1755.3	9444.2
2017	702	993.8	1695.8	111400
2018	657	982.5	1639.5	12779.5
2019	614.8	971.4	1586.2	14365.7
2020	575.3	960.5	1535.8	15901.5
2021	538.4	1015.2	1553.5	17455
2022	673.3	1069.9	1743.2	20528
2023	481.6	1057.8	1539.4	22067.4
2024	450.7	1045.8	1496.5	23563.9
2025	421.7	1034	1455.7	25019.6
2026	394.7	1022.3	1417	26436.6
2027	369.3	1010.8	1380.1	27816.6
2028	345.6	999.3	1344.9	29161.6
2029	323.4	988	1311.5	30473
2030	302.7	976.9	1279.5	31752.6
2031	283.2	965.8	1249	33001.6

5.2. Calculation of baseline activity data per post-deforestation forest class

Historical LU/LC change

The forests were not divided into zones but into different classes, hence table 12 a – c and 13 a-c are not applicable

5.3. Calculate baseline activity data per LU/LC change category

Table 14a-c are not applicable as we used method 2.

Step 6: Estimation of baseline carbon stock changes and non-CO2 emissions (Step 6 VM0015 v 1.1)

6.1. Estimation of baseline carbon stock changes

6.1.1. Estimation of the average carbon stocks of each LU/LC class

The carbon stock (emission factor) per ha that was used to estimate the average carbon stock for each LU/LC class is obtained from combination of field inventory measurement, use of allometric equations, prior research works and default values. Inventory procedures (Figure 57) and sampling protocols used is briefly presented in the section below. More detail inventory procedure applied is presented in supplementary materials 03 (a & b).

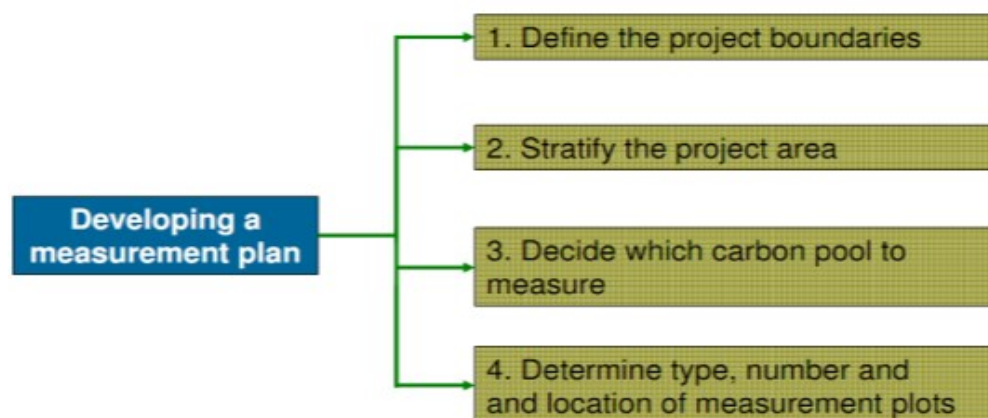


Figure 57. Processes followed in developing a measurement plan

The field inventory was conducted throughout the reference region to capture the carbon stock per hectare of the pre-deforestation forest classes. Measurements in the non-forest classes present within the leakage management area were not conducted as the default value for post deforestation land use (also called anthropic vegetation at equilibrium = AVE) for conversion of a forest into agriculture was used from the IPCC AFOLU. Prior to the determination of the total sampling plots, preliminary inventory was carried out in reference region to determine the stratifications that could best capture the heterogeneity of the vegetation (see mission report on sampling strategy for carbon stocks assessment. Based on this mission, 8 stratifications were identified based on elevation, rainfall and condition. However, preliminary carbon stocks assessment showed no significant difference in carbon stocks in all the factors, but for conservativeness, the project area was stratified based on rainfall regime, resulting in the classification of moist and dry forest classes. The actual field measurements were then carried out between October 2012 and June 2013. A total of 79 nested plots of each 1ha, 62 in moist forest; 17 in dry forest, were measured at a sampling error of 8% and for confidence interval of 95% (Figure 58).

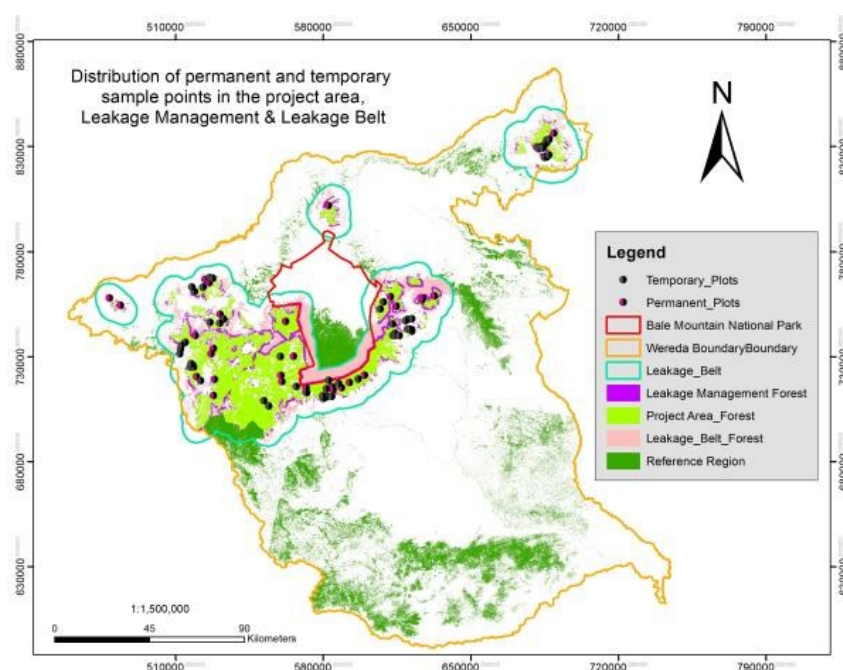


Figure 58. Distribution of permanent and temporary sample plots in the project area, leakage belt and leakage management areas.

It was agreed that the most relevant carbon pool to measure was the aboveground live woody vegetation and the belowground component which constitute a huge proportion of the carbon stocks in the project area, and are mostly impacted upon by the anthropogenic activities in the project area.

Since deadwood (standing and lying) are mostly collected by farmers as fuelwood, they were considered as insignificant proportions of carbon stocks in the project area. The soil carbon pool was also envisaged to be largely stable; hence it was conservatively left out.

A sampling unit of 1 ha size (100 m x 100 m) was used to measure the biophysical parameters required for carbon stock estimation. Within the main sampling unit, a nested plot design was established (Figure 59). Trees with diameter range between 2-14.9 cm were measured within the 15 x 15 m sub-plot. Trees with diameter range between 15-29.9 cm were captured within the 25 x 25 m sub-plot. Trees with diameter range ≥ 30 cm were counted in the main plot of 100 x 100 m. The sub-plots were replicated at the opposite corners of the main plot to ensure that the diameter classes enumerated are well represented. For each tree, in sub-plot or main plot, data was collected on species name and diameter at breast height (DBH) and height. Although the temporary and permanent sample plots were of a similar design, in the permanent sample plots, there was no 25 x 25 m sub-plot, but all trees with diameter range ≥ 15 cm were enumerated in the main 100 x 100 m plots. In this case the main plot was divided into four equal quadrates to avoid missing of trees from enumeration because of size. Trees in the permanent sample plots were also tagged and painted for

future monitoring. The total number of plots to be measured was determined using a tool developed by Winrock International for generating number of plots (<http://www.winrock.org/Ecosystems/tools.asp>).

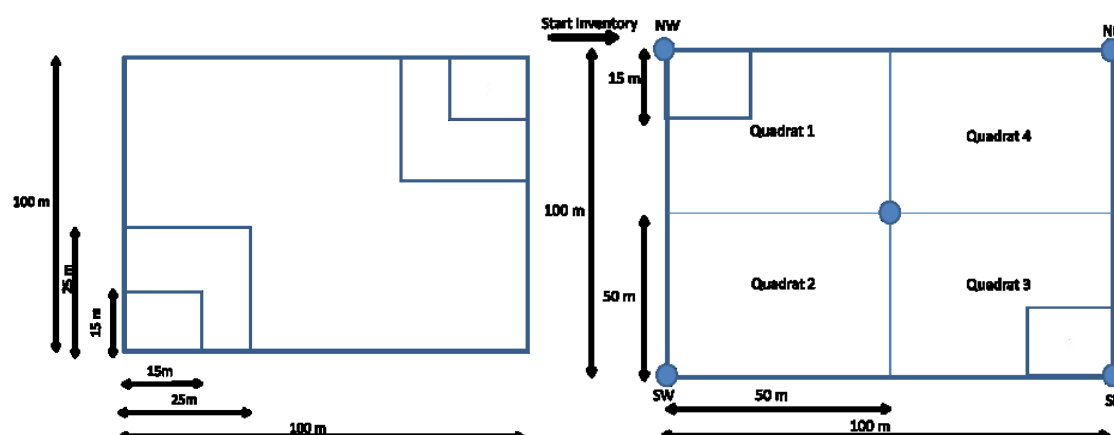


Figure 59. Nested plot design for field inventory and forest biomass assessment (left temporary nested plots; Right: permanent nested plots)

The samples were distributed between the two strata proportional to size, hence 62 in the moist evergreen Afromontane forest and 17 in the dry Afromontane forest. The 1 ha size plot formed the main plot structure which was sub-divided to form a nested plot structure for measuring trees of different sizes following the description of Pearson et al, (2005), and as recommended in VM0015 v 1.1 as well. The total number of plots was determined using the procedure described by Pearson et al (2005). To reach at 79 plot number, 8% error level and 95% confidence level were selected in conformity with VM0015 v 1.1. Mean carbon stocks and standard deviation were generated from a quick preliminary inventory in the two forest stratification. These were fed into an online tool developed by Winrock International for generating number of plots (<http://www.winrock.org/Ecosystems/tools.asp>).

Above-ground biomass:

The dendrometric parameters from the field measurements were entered and analysed in Microsoft excel using Chaves et al, (2005)³ allometric equations for tropical moist and tropical dry forests to determine dry weight of plants. For tree species in the dry forests, equation 1 was used, while equation 2 was used for tree species in the moist forests. Though height measurements for selected trees were taken, regression analysis of height-diameter relationship was weak. Hence, in the spirit of conservativeness and to avoid overestimation, height was not included as input variable for the estimation of biomass. As a result, equations 4 and 5 were chosen because they only have DBH (cm) and wood density (WD = g/cm³) as input variables. A conservative wood density value of 0.60 g/cm³ for Bale eco-region species was used (average wood density being 0.67 g/cm³), which was established based on data on wood density reported for a number of indigenous and exotic species in Ethiopia by Desalegn et al. (2012) (supplementary material 32). This was used as one of the input variables in the allometric equations.

$$Y \text{ (kg)} = X * \exp(-0.667 + (1.784 * \ln(D)) + (0.207 * (\ln(D))^2) - (0.0281 * (\ln(D))^3)) \dots\dots\dots \text{equation 4}$$

³ Destructive measurement was not done to validate the allometric equation as it was stated by Brown (2002) that grouping all species together and using generalized allometric relationships that are stratified by broad forest types or ecological zones has been highly effective in the tropics. In the evergreen forests of Ghana, Henry et al. (2010) also found that the Chave et al (2005) model provided accurate estimates of tree biomass (R²= 97% and mean bias = 3.74%). Considering that constructing allometric models specific to each country is destructive, time-consuming and expensive, we suggest using the Chave et al. (2005) model as a first approximation to estimate tree biomass when country-specific allometric models are not available. The Chave et al (2005) model should be especially valuable in Africa, considering that the continent's tropical forests represent 30% of the global total (FAO, 2005) and that almost no allometric models are available for Africa (but see Henry et al. (2010) and Kaonga and Bayliss-Smith (2010)).

$$Y \text{ (Kg)} = X \cdot \exp(-1.499 + (2.148 \cdot \ln(D)) + (0.207 \cdot (\ln(D))^2) - (0.0281 \cdot (\ln(D))^3)) \dots \text{equation 5}$$

Where,

Y = aboveground biomass (kg)

X = WD (g.cm-3),

D = DBH (cm),

Carbon stock was estimated by converting measured dry weight for each individual to carbon, according to equation 3 (IPCC good practice guide- Supplementary material 08), as follows:

$$C_{abg} = Y_{abg} \times 0.5 \dots \text{equation 6}$$

Where,

C_{abg} = Above-ground;

Y_{abg} = estimated dry weight for each individual

Below-ground carbon stocks: In calculating the belowground biomass, a root – shoot ratio of 0.24 and 0.27 of dry biomass was used for moist and dry forests respectively based on the IPCC good practice guide. These are mean values obtained from the IPCC database (Supplementary material 08).

The results of the inventory showed a sampling error of the entire population of 8%. The mean carbon stocks of aboveground biomass of the moist forest was 178.43± 122.28 tC/ha, with that of the dry forest being 100.99± 65.55 tC/ha. Hence the aboveground biomass carbon stock for the calculation of emissions reduction was 178.43 and 100.99 tC/ha for moist and dry forests respectively.

In calculating the belowground biomass, a root – shoot ratio of 0.24 and 0.27 of dry biomass was used for moist and dry forests respectively. These are mean values obtained from the IPCC database (IPCC guide practice guide; table 3A.8); <http://www.ipcc.ch/meetings/session21/doc5to8/chapter3a1.pdf>). This resulted in a mean belowground biomass carbon stocks of 42.82± 29.35 and 27.27± 17.70 for moist and dry forests respectively.

The carbon stock change without the project intervention involves the clearing of tropical moist and dry forests to agricultural crops, mostly annuals such as teff, barley, wheat and maize. The IPCC default carbon stocks for annual croplands of 5 tC/ha (equivalent of 18.33 tCO_{2e}/ha) was used for the carbon stocks estimates for agricultural land use, which in our case represents the post-deforestation class also called Anthropogenic Vegetation in Equilibrium (AVE).

The total carbon (aboveground plus belowground carbon stocks) amounted to 218.19 and 126.64 tC/ha, which is equivalent to 802.68 and 464.33 tCO₂/ha for the moist and dry forests respectively. The project therefore comprises of two forest stratifications (moist and dry forests), with values for the initial forest class in the moist forest (Ic1) being 802.68 tCO_{2e}/ha, converted to the final class with AVE (Fcl) with 18.33 tCO_{2e}/ha, resulting in an emission factor of 784.36 tCO_{2e}/ha. On the other hand, the value for the initial forest class of the dry forest (Ic2) is 464.33 tCO₂-e/ha, converted to the final forest class with AVE (Fcl) of 18.33 tCO_{2e}/ha, resulting in an emission factor of 446.00 tCO_{2e}/ha (Table 31).

Table 33. Carbon stocks per hectare of initial forest classes *ic/* existing in the project area and leakage belt ((Table 15.a&b, Methodology VM0015 v 1.1: Note that the carbon stock is the same as we have not considered degradation).

Table 15.a1. Estimated values (stratum: Moist forest)

Ct year	Initial forest class icl Name: Moist forest IDid: Icl1					
	Average carbon stock per hectare±95% CI					
	<i>Cab_{cl}</i>		<i>Cbb_{cl}</i>		<i>Ctot_{cl}</i>	
	average stock	± 95% CI	average stock	± 95% CI	average stock	± 95% CI
	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹
2012	647.33	441.32	155.36	105.92	802.69	547.24
2013	647.33	441.32	155.36	105.92	802.69	547.24
2014	647.33	441.32	155.36	105.92	802.69	547.24
2015	647.33	441.32	155.36	105.92	802.69	547.24
2016	647.33	441.32	155.36	105.92	802.69	547.24
2017	647.33	441.32	155.36	105.92	802.69	547.24
2018	647.33	441.32	155.36	105.92	802.69	547.24
2019	647.33	441.32	155.36	105.92	802.69	547.24
2020	647.33	441.32	155.36	105.92	802.69	547.24
2021	647.33	441.32	155.36	105.92	802.69	547.24
2022	647.33	441.32	155.36	105.92	802.69	547.24
2023	647.33	441.32	155.36	105.92	802.69	547.24
2024	647.33	441.32	155.36	105.92	802.69	547.24
2025	647.33	441.32	155.36	105.92	802.69	547.24
2026	647.33	441.32	155.36	105.92	802.69	547.24
2027	647.33	441.32	155.36	105.92	802.69	547.24
2028	647.33	441.32	155.36	105.92	802.69	547.24
2029	647.33	441.32	155.36	105.92	802.69	547.24
2030	647.33	441.32	155.36	105.92	802.69	547.24
2031	647.33	441.32	155.36	105.92	802.69	547.24

Table 15.a2. Estimated values (stratum: dry forest)

Ct year	Initial forest class icl Name: Dry forest IDid: Icl2					
	Average carbon stock per hectare±95% CI					
	<i>Cab_{cl}</i>		<i>Cbb_{cl}</i>		<i>Ctot_{cl}</i>	
	average stock	± 95% CI	average stock	± 95% CI	average stock	± 95% CI
	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹
2012	365.62	226.45	98.72	61.14	464.33	287.59
2013	365.62	226.45	98.72	61.14	464.33	287.59
2014	365.62	226.45	98.72	61.14	464.33	287.59
2015	365.62	226.45	98.72	61.14	464.33	287.59
2016	365.62	226.45	98.72	61.14	464.33	287.59
2017	365.62	226.45	98.72	61.14	464.33	287.59
2018	365.62	226.45	98.72	61.14	464.33	287.59
2019	365.62	226.45	98.72	61.14	464.33	287.59
2020	365.62	226.45	98.72	61.14	464.33	287.59
2021	365.62	226.45	98.72	61.14	464.33	287.59
2022	365.62	226.45	98.72	61.14	464.33	287.59
2023	365.62	226.45	98.72	61.14	464.33	287.59
2024	365.62	226.45	98.72	61.14	464.33	287.59
2025	365.62	226.45	98.72	61.14	464.33	287.59
2026	365.62	226.45	98.72	61.14	464.33	287.59
2027	365.62	226.45	98.72	61.14	464.33	287.59
2028	365.62	226.45	98.72	61.14	464.33	287.59
2029	365.62	226.45	98.72	61.14	464.33	287.59
2030	365.62	226.45	98.72	61.14	464.33	287.59
2031	365.62	226.45	98.72	61.14	464.33	287.59

Table 15 b1. Value to be used after discounting for uncertainties (Stratum: moist forest)

Ct year	Initial forest class icl Name: Moist forest IDid: Icl1					
	Average carbon stock per hectare±95% CI					
	<i>Cab_{cl}</i>		<i>Cbb_{cl}</i>		<i>Ctot_{cl}</i>	
	average stock	± 95% CI	average stock	± 95% CI	average stock	± 95% CI
	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹
2012					510.91	
2013					510.91	

2014					510.91	
2015					510.91	
2016					510.91	
2017					510.91	
2018					510.91	
2019					510.91	
2020					510.91	
2021					510.91	
2022					510.91	
2023					510.91	
2024					510.91	
2025					510.91	
2026					510.91	
2027					510.91	
2028					510.91	
2029					510.91	
2030					510.91	
2031					510.91	

Table 15.b2. Stratum: dry forest

Ct year	Initial forest class icl Name: Dry forest IDid: Icl2					
	Average carbon stock per hectare±95% CI					
	Cab _{cl}		Cbb _{cl}		Ctot _{cl}	
	average stock	± 95% CI	average stock	± 95% CI	average stock	± 95% CI
	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹	t CO _{2e} ha ⁻¹
2012					295.55	
2013					295.55	
2014					295.55	
2015					295.55	
2016					295.55	
2017					295.55	
2018					295.55	
2019					295.55	
2020					295.55	
2021					295.55	
2022					295.55	
2023					295.55	
2024					295.55	
2025					295.55	

2026					295.55	
2027					295.55	
2028					295.55	
2029					295.55	
2030					295.55	
2031					295.55	

Where (in the table):

Cab_{cl} Average carbon stock in the above-ground biomass carbon pool of lcl in tCO₂-eha⁻¹

Cbb_{cl} Average carbon stock in the below-ground biomass carbon pool of lcl in tCO₂-eha⁻¹

C_{tot} Total carbon stock per ha in tCO₂-eha⁻¹

6.1.1. Calculate the long-term (20-years) average carbon stocks of post-deforestation classes (6.1.1.e, vm0015, v1.1)

In the Bale eco-region, post deforestation class is smallholder farmland, and this land use remains more or less the same long after deforestation except slight shifts in the type of crops grown following traditional crop rotation. Therefore, the carbon stock in this post-deforestation class is assumed to remain constant. Measurements in this non-forest class was not conducted and the default value of anthropic vegetation in equilibrium (F_{cl}) of 18.33 tCO₂ -e/ha was used (Table 34: Table 16 of the methodology; VM0015, v1.1). This was the same for the area-weighted average carbon stocks of the post-deforestation LU/LC classes existing within each zone (Table 35: table 17 of the methodology; VM0015 V1.1).

Table 34. Long-term (20-years) average carbon stocks per hectare of post-deforestation LU/LC classes present in the reference region (Table 16, VM0015, v1.1)

Project year T	Post deforestation class <i>fcl</i>																		
	Name	Non-forest class (Fcl1)																	
	ID <i>fcl</i>																		
	Average Carbon stock per hectare ±90% CI																		
<i>Cab fcl</i>		<i>Cbb fcl</i>		<i>Cdwfcl</i>		CI <i>fcl</i>		<i>Csoc fcl</i>		Short lived <i>fcl</i>		<i>Cwp fcl</i> ⁽⁴⁾ medium lived **		Long lived		C tot <i>fcl</i>			
average stock tCO2 e ha ⁻¹	±90% CI tCO2 e ha ⁻¹	average stock tCO2 e ha ⁻¹	±90% CI tCO2 e ha ⁻¹	average stock tCO2 e ha ⁻¹	±90% CI tCO2 e ha ⁻¹	average stock tCO2 e ha ⁻¹	±90% CI tCO2 e ha ⁻¹	average stock tCO2 e ha ⁻¹	±90% CI tCO2 e ha ⁻¹	average stock tCO2 e ha ⁻¹	±90% CI tCO2 e ha ⁻¹	C stock tCO2 e ha ⁻¹ 1	±90% CI tCO2 e ha ⁻¹	C stock tCO2 e ha ⁻¹ 1	±90% CI tCO2 e ha ⁻¹	C stock tCO2 e ha ⁻¹ 1	±90% CI tCO2 e ha ⁻¹	Caverage stock tCO2 e ha ⁻¹	±90% CI tCO2 e ha ⁻¹
2012	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2022	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2024	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2026	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2027	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2028	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2029	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2030	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2031	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average to be used in calculation	18.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* 0-3 years ** 3-100 years *** > 100 years (4) = Total carbon stocks in wood products in post-deforestation land-uses is considered insignificant a priori in VM0015, V2.0 *
After discounts for uncertainties (see 6.1.1.f, and Appendix 2)

Table 35. Long-term (20- years) area weighted average carbon stock per zone (Table 17; vm0015, v1.1)

Zone		Post- deforestation LU/LC- class fcl												Average weighted log-term (20 years) average carbon stock per zone 2							
		Name	Non-forest class (fcl1)					Name													
ID _z	Name	ID fcl	1					ID fcl	FCL												
		C ab fcl C stock t CO2 e ha ⁻¹	C bb fcl C stock t CO2 e ha ⁻¹	C dw fcl C stock t CO2 e ha ⁻¹	Cl fcl C stock t CO2 e ha ⁻¹	C soc fcl C stock t CO2 e ha ⁻¹	C wp fcl C stock t CO2 e ha ⁻¹	C ab fcl C stock t CO2 e ha ⁻¹	C bb fcl C stock t CO2 e ha ⁻¹	C dw fcl C stock t CO2 e ha ⁻¹	Cl fcl C stock t CO2 e ha ⁻¹	C soc fcl C stock t CO2 e ha ⁻¹	C wp fcl C stock t CO2 e ha ⁻¹	C ab ₂ fcl C stock t CO2 e ha ⁻¹	C bb ₂ fcl C stock t CO2 e ha ⁻¹	C dw ₂ fcl C stock t CO2 e ha ⁻¹	Cl ₂ fcl C stock t CO2 e ha ⁻¹	C soc ₂ fcl C stock t CO2 e ha ⁻¹	C wp ₂ fcl C stock t CO2 e ha ⁻¹	C tot C stock t CO2 e ha ⁻¹	
1	Zone1	18.33	0	0	0	0	0	0	0	0	0	0	0	18.33	0	0	0	0	0	0	18.33

6.1.2 Calculation of carbon stock change factors (vm0015, v1.1)

For the Bale project we have assumed no growth or no carbon stock change both in the baseline and project cases. Therefore, Table 20a and b of the methodology VM0015, V1.1 (Table 36 and 37 below) are assumed zero.

Table 36. Carbon stock change factors for initial forest classes *icl* (Method 1) (Table 20.a.; vm0015, v1.1)

Forest class		Dry forest								Moist forest							
Year after deforestation		ΔC_{ab} icl,t	ΔC_{bb} icl,t	ΔC_{dw} icl,t	ΔC_I icl,t	ΔC_{soc} icl,t	ΔC_{wp} icl,t			ΔC_{ab} icl,t	ΔC_{bb} icl,t	ΔC_{dw} icl,t	ΔC_I icl,t	ΔC_{soc} icl,t	ΔC_{wp} icl,t		
							Short-lived	Medium-lived	Long-lived						Short-lived	Medium-lived	Long-lived
1	t*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	t*+1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	t*+2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	t*+3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	t*+4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	t*+5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	t*+6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	t*+7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	t*+8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	t*+9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	t*+10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	t*+11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	t*+12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	t*+13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	t*+14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	t*+15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	t*+16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	t*+17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	t*+18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	t*+19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21+T	t*+20,...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 37. Carbon stock change factors for final classes *fc*/ or zones *z* (Method 1) (table 20.b., vm0015, v1.1)

Forest class		Dry forest								Moist forest							
Year after deforestation		ΔC_{ab}	ΔC_{bb}	ΔC_{dw}	ΔC_{ci}	ΔC_{soc}	$\Delta C_{wpz_{l,t}}$			ΔC_{ab}	ΔC_{bb}	ΔC_{dw}	ΔC_{ci}	ΔC_{soc}	$\Delta C_{wpz_{l,t}}$		
		z,t	z,t	z,t	z,t	z,t	Short-lived	Medium-lived	Long-lived	z,t	z,t	z,t	z,t	z,t	Short-lived	Medium-lived	Long-lived
1	t^*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	t^*+1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	t^*+2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	t^*+3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	t^*+4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	t^*+5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	t^*+6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	t^*+7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	t^*+8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	t^*+9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	t^*+10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	t^*+11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	t^*+12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	t^*+13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	t^*+14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	t^*+15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	t^*+16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	t^*+17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	t^*+18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	t^*+19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

6.1.3. Calculation of baseline carbon stock changes (VM0015 v 1.1)

The method used to calculate changes in carbon stocks in the baseline scenario followed method 1 (activity data are available for classes) in step 6.1.2 VM0015 v 1.1.

The carbon of the two forest classes were obtained through biomass inventory conducted for the Bale Mountains Eco-Region REDD+ Project. The changes in carbon a stock for pre-deforestation in the baseline scenario is presented in table 32 (Table 15a of VM0015 v 1.1.). For post-deforestation class (non-forest land use) we used anthropic vegetation in equilibrium carbon content of 18 t-CO₂-e following default value from IPCC as presented in table 33 (Table 15b VM0015 v 1.1). The total net baseline carbon stock change in the project at year t was calculated as follows:

$$\Delta CBSLPA_t = \sum_{icl=1}^{Icl} ABSLPA_{icl,t} * Ctot_{icl,t} - \sum_{fcl=1}^{Fcl} ABSLPA_{fcl,t} * Ctot_{fcl,t}$$

Where:

$\Delta CBSLPA_t$ = Total baseline carbon stock change within the project area at year t ; tCO₂-e

$ABSLPA$ = Area of initial forest class icl deforested at time t within the project area in the baseline case; ha

$Ctot_{icl,t}$ = Average carbon stock of all accounted carbon pools in the initial forest class icl at time t ; tCO₂-e

$ABSLPA_{fcl,t}$ = Area of the final non-forest class fcl at time t within the project area in the baseline case; ha

$Ctot_{fcl,t}$ = Average carbon stock of all accounted carbon pools in non-forest class fcl at time t ; tCO₂-e

icl 1, 2, 3 ... Icl initial (pre-deforestation) forest classes; dimensionless

fcl 1, 2, 3 ... Fcl final (post-deforestation) non-forest classes; dimensionless

t 1, 2, 3 ... T , a year of the proposed project crediting period; dimensionless

Table 38. Changes in carbon stocks in classes of pre-deforestation (forests) in the baseline scenario (Table 19.a, VM0015, v1.1).

Project year t	Carbon stock changes in initial (pre-deforestation) forest classes				Total Carbon Stock Change in initial forest classes	
	Dry forest		Moist forest			
	ABSLPA _{ic,t} ha	C _{totic,t} t CO ₂ -e ha	ABSLPA _{ic,t} ha	C _{totic,t} t CO ₂ -e ha	Annual ΔCBSLP _{it}	Cumulative ΔCBSLP _i
2012	1225.1	295.55	4016.5	510.91	2414153.351	2414153.351
2013	1146.4	295.55	3971.1	510.91	2367698.323	4781851.673
2014	1072.8	295.55	3926.2	510.91	2323006.046	7104857.719
2015	1004	295.55	3881.8	510.91	2279987.855	9384845.575
2016	939.5	295.55	3837.9	510.91	2238495.977	11623341.55
2017	879.2	295.55	3794.5	510.91	2198500.857	13821842.41

2018	822.7	295.55	3751.6	510.91	2159884.275	15981726.68
2019	769.9	295.55	3709.2	510.91	2122616.676	18104343.36
2020	720.5	295.55	3667.3	510.91	2086609.397	20190952.76
2021	674.2	295.55	3625.8	510.91	2051722.682	22242675.44
2022	990.1	295.55	2058.8	510.91	1344487.427	23587162.87
2023	611.9	295.55	3414.8	510.91	1925507.638	25512670.5
2024	572.6	295.55	3376.2	510.91	1894171.403	27406841.91
2025	535.8	295.55	3338	510.91	1863778.403	29270620.31
2026	501.4	295.55	3300.3	510.91	1834350.174	31104970.48
2027	469.2	295.55	3263	510.91	1805776.515	32910747
2028	439.1	295.55	3226.1	510.91	1778027.872	34688774.87
2029	410.9	295.55	3189.7	510.91	1751096.227	36439871.1
2030	384.5	295.55	3153.6	510.91	1724849.841	38164720.94
2031	359.8	295.55	3118	510.91	1699361.343	39864082.28

Table39. Baseline carbon stock change in post-deforestation (non-forest) classes (Table 19.b., VM0015, v1.1).

Project year t	Total Carbon Stock Change in final non- forest classes				Total carbon change in final non-forest class	
	Dry forest		Moist forest		Annual Δ CBSLPAft tCO ₂ e	Cumulative Δ CBSLPAft tCO ₂ e
	ABSLPA fcl,t ha	Anthropic vegetation in equilibrium tCO ₂ -e ha	ABSLPA fcl,t ha	Anthropic vegetation in equilibrium tCO ₂ -e ha		
2012	1225.1	18.33	4016.5	18.33	96096.00	96096.00
2013	1146.4	18.33	3971.1	18.33	93820.83	189916.83
2014	1072.8	18.33	3926.2	18.33	91648.33	281565.17
2015	1004	18.33	3881.8	18.33	89573.00	371138.17
2016	939.5	18.33	3837.9	18.33	87585.67	458723.83
2017	879.2	18.33	3794.5	18.33	85684.50	544408.33
2018	822.7	18.33	3751.6	18.33	83862.17	628270.50
2019	769.9	18.33	3709.2	18.33	82116.83	710387.33
2020	720.5	18.33	3667.3	18.33	80443.00	790830.33
2021	674.2	18.33	3625.8	18.33	78833.33	869663.67
2022	990.1	18.33	2058.8	18.33	55896.50	925560.17
2023	611.9	18.33	3414.8	18.33	73822.83	999383.00
2024	572.6	18.33	3376.2	18.33	72394.67	1071777.67
2025	535.8	18.33	3338	18.33	71019.67	1142797.33
2026	501.4	18.33	3300.3	18.33	69697.83	1212495.17
2027	469.2	18.33	3263	18.33	68423.67	1280918.83
2028	439.1	18.33	3226.1	18.33	67195.33	1348114.17
2029	410.9	18.33	3189.7	18.33	66011.00	1414125.17
2030	384.5	18.33	3153.6	18.33	64865.17	1478990.33
2031	359.8	18.33	3118	18.33	63759.67	1542750.00

Table 40. Total net baseline carbon stock change in the project area (Table 19.c, VM0015 v 1.1.)
(calculated with method I: activity data per class)

Project year <i>t</i>	Total carbon stock change in initial forest classes		Total carbon stock change in final non-forest classes		Total baseline carbon stock change in the project area	
	Annual	Cumulative	Annual	Cumulative	Annual ΔCBSLPA_t t-CO ₂ -e	Cumulative ΔCBSLPA t-CO ₂ -e
2012	2414153.351	2414153.351	96096.00	96096.00	2318057.35	2318057.35
2013	2367698.323	4781851.673	93820.83	189916.83	2273877.49	4591934.84
2014	2323006.046	7104857.719	91648.33	281565.17	2231357.71	6823292.55
2015	2279987.855	9384845.575	89573.00	371138.17	2190414.86	9013707.41
2016	2238495.977	11623341.55	87585.67	458723.83	2150910.31	11164617.72
2017	2198500.857	13821842.41	85684.50	544408.33	2112816.36	13277434.08
2018	2159884.275	15981726.68	83862.17	628270.50	2076022.11	15353456.18
2019	2122616.676	18104343.36	82116.83	710387.33	2040499.84	17393956.03
2020	2086609.397	20190952.76	80443.00	790830.33	2006166.40	19400122.42
2021	2051722.682	22242675.44	78833.33	869663.67	1972889.35	21373011.77
2022	1344487.427	23587162.87	55896.50	925560.17	1288590.93	22661602.70
2023	1925507.638	25512670.5	73822.83	999383.00	1851684.80	24513287.50
2024	1894171.403	27406841.91	72394.67	1071777.67	1821776.74	26335064.24
2025	1863778.403	29270620.31	71019.67	1142797.33	1792758.74	28127822.98
2026	1834350.174	31104970.48	69697.83	1212495.17	1764652.34	29892475.32
2027	1805776.515	32910747	68423.67	1280918.83	1737352.85	31629828.17
2028	1778027.872	34688774.87	67195.33	1348114.17	1710832.54	33340660.71
2029	1751096.227	36439871.1	66011.00	1414125.17	1685085.23	35025745.93
2030	1724849.841	38164720.94	64865.17	1478990.33	1659984.67	36685730.61
2031	1699361.343	39864082.28	63759.67	1542750.00	1635601.68	38321332.28

6.2. Baseline non-CO₂ emissions from forest fire

This step is not applicable to the BMERP, since forest fires have not been included in the baseline scenario. Therefore, Table 18 and 19 of VM0015 v 1.1 methodology was not included because it refers to estimates of non-CO₂ emissions from forest fires.

5.4 Project Emissions (CL2)

Step 7. Ex ante estimation of actual carbon stock changes and non-CO₂ emissions in the project area (VM0015 v 1.1)

The goal of this step is to provide an ex-ante estimate of the future carbon stock changes under the project scenario. Since actual carbon stock changes will be subject to Measurement, Reporting & Verification and Accounting, the rationale of these ex-ante estimates is to guide optimal implementation of emission reduction measures, and to allow reasonable projections of revenues to be made

7.1. Ex ante estimation of actual carbon stock changes (VM0015 v 1.1)

7.1.1. Ex ante estimation of actual carbon stock changes due to planned activities (VM0015 v 1.1)

The project activities do not include any planned deforestation or harvesting above that existing in the baseline case. Furthermore, no carbon stock increases will be claimed for in areas that would be deforested in the baseline scenario. Therefore it is not necessary to complete Tables 25a-d or 26a-d of the methodology.

7.1.2. Ex ante estimation of carbon stock changes due to unavoidable unplanned deforestation within the project area (Step 7.1.2 VM0015 v1.1)

The actual emissions reductions generated by the BMERP will be determined through *ex-post* measurements of project results based on its monitoring plan. Here, under the assumption of project effectiveness and following the methodology requirements, the *ex-ante* carbon stock changes within the project area are estimated by multiplying the annual total baseline carbon stock change by the factor (1-EI), where (EI) is an Effectiveness Index ranging from 0 (no effectiveness) to 1 (maximum effectiveness).

The EI was estimated based on the effectiveness of project activities in addressing deforestation. Conservation arrangements to ex ante estimation of carbon stock changes due to unavoids unplanned deforestation were considered. The project assumes an effectiveness index of 50% during the initial years of implementation and will increase gradually to 80% later. This factor takes into account any unexpected changes in carbon stocks, potentially generated by expansion of family farming areas, unavoidable unplanned logging or encroachment etc.

$$\Delta CUDdPA_t = \Delta CBSL_t * (1 - EI)$$

Where:

$\Delta CUDdPA_t$ = Total *ex ante* actual carbon stock change due to unavoids unplanned deforestation at year *t* in the project area; tCO₂-e

$\Delta CBSL_t$ = Total baseline carbon stock change at year *t* in the project area; tCO₂-e

EI = *Ex ante* estimated Effectiveness Index; %

t = 1, 2, 3 ... *T*, a year of the proposed project crediting period; dimensionless

7.1.3. Ex ante estimated net actual carbon stock changes in the project area (VM0015 v 1.1)

The results of the step 7.1.2. VM0015 V1.1 above is summarized in Table 39.

Table 41. *Ex ante* estimated net carbon stock change in the project area under the project scenario (Table 27, VM0015v1.0)

Project year <i>t</i>	Total carbon stock decrease due to planned activities		Total carbon stock increase due to planned activities		Total carbon stock decrease due to unavoids unplanned deforestation		Total carbon stock change in the project case	
	Annual tCO ₂ -e ΔCPAdP At	Cum. tCO ₂ -e ΔCPAdPA	Annual ΔCPAiP At tCO ₂ -e	Cum. ΔCPAiP A tCO ₂ -e	Annual ΔCUDdPA tCO ₂ -e	Cum. ΔCUDdPA tCO ₂ -e	Annual ΔCPSPA tCO ₂ -e	Cum. ΔCPSPA tCO ₂ -e
2012	0	0	0	0	1159028.68	1159028.68	1159028.68	1159028.68
2013	0	0	0	0	1136938.74	2295967.42	1136938.74	2295967.42
2014	0	0	0	0	1115678.86	3411646.28	1115678.86	3411646.28
2015	0	0	0	0	1095207.43	4506853.70	1095207.43	4506853.70
2016	0	0	0	0	1075455.16	5582308.86	1075455.16	5582308.86
2017	0	0	0	0	739485.72	6321794.58	1373330.63	6955639.49
2018	0	0	0	0	726607.74	7048402.32	1349414.37	8305053.86
2019	0	0	0	0	714174.95	7762577.27	1326324.90	9631378.76
2020	0	0	0	0	702158.24	8464735.51	1304008.16	10935386.92
2021	0	0	0	0	690511.27	9155246.78	1282378.08	12217764.99
2022	0	0	0	0	257718.19	9412964.96	1030872.74	13248637.74
2023	0	0	0	0	370336.96	9783301.92	1481347.84	14729985.58
2024	0	0	0	0	364355.35	10147657.27	1457421.39	16187406.97
2025	0	0	0	0	358551.75	10506209.02	1434206.99	17621613.96

2026	0	0	0	0	352930.47	10859139.49	1411721.87	19033335.83
2027	0	0	0	0	347470.57	11206610.06	1389882.28	20423218.11
2028	0	0	0	0	342166.51	11548776.56	1368666.03	21791884.14
2029	0	0	0	0	337017.05	11885793.61	1348068.18	23139952.32
2030	0	0	0	0	331996.93	12217790.54	1327987.74	24467940.06
2031	0	0	0	0	327120.34	12544910.88	1308481.34	25776421.40

Step 7.2. Ex ante estimation of actual non-CO2 emissions from forest fires

Not applicable

Step 7.3 Total *Ex ante* estimations for the project area

The total ex ante estimation of emissions for the project area is reported in Table 40.

Table 42.. Total ex *ante* estimated actual net carbon stock changes and emission of non-CO₂ gases in the project area (Table 29 Methodology VM0015v1.1)

Project year t	Total ex <i>ante</i> carbon stock decrease due to planned activities		Total ex <i>ante</i> carbon stock increase due to planned activities		Total ex <i>ante</i> carbon stock decrease due to unavoided and unplanned deforestation		Total ex-ante net carbon stock change		Total ex-ante estimated actual non-CO ₂ emissions form forest fires in the project area	
	Annual tCO ₂ -e ΔCPAdPA _t	Cum. tCO ₂ -e ΔCPAdPA	Annual ΔCPAiPA _t tCO ₂ -e	Cum. ΔCPAiPA tCO ₂ -e	Annual ΔCUDdPA _t tCO ₂ -e	Cum. ΔCUDdPA tCO ₂ -e	Annual ΔCPSPA _t tCO ₂ -e	Cum. ΔCPSPA tCO ₂ -e	Annual	Cum
2012	0	0	0	0	1159028.68	1159028.68	1159028.68	1159028.68	0	0
2013	0	0	0	0	1136938.74	2295967.42	1136938.74	2295967.42	0	0
2014	0	0	0	0	1115678.86	3411646.28	1115678.86	3411646.28	0	0
2015	0	0	0	0	1095207.43	4506853.70	1095207.43	4506853.70	0	0
2016	0	0	0	0	1075455.16	5582308.86	1075455.16	5582308.86	0	0
2017	0	0	0	0	739485.72	6321794.58	739485.72	6321794.58	0	0
2018	0	0	0	0	726607.74	7048402.32	726607.74	7048402.32	0	0
2019	0	0	0	0	714174.95	7762577.27	714174.95	7762577.27	0	0
2020	0	0	0	0	702158.24	8464735.51	702158.24	8464735.51	0	0
2021	0	0	0	0	690511.27	9155246.78	690511.27	9155246.78	0	0
2022	0	0	0	0	257718.19	9412964.96	257718.19	9412964.96	0	0
2023	0	0	0	0	370336.96	9783301.92	370336.96	9783301.92	0	0
2024	0	0	0	0	364355.35	10147657.27	364355.35	10147657.27	0	0
2025	0	0	0	0	358551.75	10506209.02	358551.75	10506209.02	0	0
2026	0	0	0	0	352930.47	10859139.49	352930.47	10859139.49	0	0
2027	0	0	0	0	347470.57	11206610.06	347470.57	11206610.06	0	0
2028	0	0	0	0	342166.51	11548776.56	342166.51	11548776.56	0	0
2029	0	0	0	0	337017.05	11885793.61	337017.05	11885793.61	0	0
2030	0	0	0	0	331996.93	12217790.54	331996.93	12217790.54	0	0
2031	0	0	0	0	327120.34	12544910.88	327120.34	12544910.88	0	0

5.5 Leakage (CL3)

Step 8. Ex ante estimation of Leakage

The goal of this step is to provide an ex-ante estimate of the possible decrease in carbon stock and increase in GHG emissions due to leakage. This will assist in designing the optimal leakage prevention measures, identify sources of leakage that are potentially significant and therefore subject to MRV, and to allow making reasonable projections of revenues. Two sources of leakage are considered – that associated with leakage prevention measures, and that associated with activity displacement leakage.

Step 8.1 Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to leakage prevention measures

8.1. Carbon stock changes due to activities implemented in leakage management areas

Step 8.1.1 Carbon stock changes due to activities implemented in leakage management areas

The project proponent considers emissions related to leakage management activities as insignificant. This is because leakage prevention activities in the Bale project case, which include tree plantings, energy efficient cove stove usage, improved agricultural land management and the like, all are rather activities that reduce emission of GHG, rather than themselves net emitters. Most of these activities are done through local labour forces (see section 2.2 and table 43). There will be no involvement of fossil fuel usage, heavy machinery involvement or deforestation/degradation of forest. The project proponent will implement the activities through and with the involvement of local communities (agents of deforestation) in implementing the different activities. These activities target to improve the livelihoods and living conditions of the agents such as energy efficient stoves, improved agricultural system management, natural resources based livelihoods diversification. These activities will not be expected to generate significant GHGs. Therefore, tables 25a, b and c are not applicable.

Table 43. List of leakage prevention activities and their impact on carbon stock change/GHG emission

No.	Major leakage prevention measures planned	Description
1	Efficient stove	Made locally and distributed using human power
2	Agricultural land management	This will mainly focus on improved management of land and soil through crop residue management, use of compost and manure as well as adoption of improved varieties. Consequently, it will rather sequester carbon in soil rather than emitting GHG.
3	Agroforestry	This will involve planting trees in homegarden as well as farm boundaries to provide alternative sources of wood products for local use. Nurseries will be established locally, seedlings raised by using human labour and planting also involve family labour force
4	Woodlot establishment	Communal or private woodlots will be established on communal lands or private lands for increasing supply of wood products of local demand to reduce pressure on the natural forests. These operations will also involve more of human labour force and no machinery will involve

Given that these activities are judged to pose no risk of carbon stock reductions, it is not deemed necessary to map them or make calculations of significance. Therefore, Tables 30a-c of the methodology need not be completed.

Step 8.1.2/8.1.3. Ex ante estimation of CH₄ and N₂O emissions from grazing animals

Project activities associated with leakage prevention do not include any livestock management, therefore emissions as result of grazing are not considered. The Bale REDD+ project activities to manage the leakage within the leakage management area will not result in GHG emissions and carbon stock change within the belt (Refer to table 43 above). Thus Tables 32 and 33 of the

methodology are not required, since expected ex-ante emissions above baseline from these sources will be zero.

Step 8.2. Ex ante estimation of the decrease in carbon stocks and increase in GHG emissions due to activity displacement leakage

The designed leakage management activities (section 5.2) and project activities (section 2.2) are expected to address the possible displacement of deforestation due to the project into the leakage belt. However, if there will be significant displacement observed above the baseline scenario in the leakage belt ex post monitoring will reveal the quantity of GHG emission increased into the leakage belt. This can be reduced from the project claimed ultimately. Therefore, as we do not expect activity displacement table 34 of the methodology is not applicable.

Step 8.3. Ex ante estimation of total leakage

Table 44 is also not applicable (however, 'zero' values inserted in the table)

Table 44. Ex ante estimated total leakage (table 34 of the Methodology, VM0015, v1.1)

Project year	Total ex ante GHG emissions from increased grazing		Total ex ante increase in GHG due to displaced forest fire		Total ex ante decrease in carbon stock due to displaced deforestation		Carbon stock decrease due to leakage prevention measures		Total net carbon stock change due to leakage		Total net increase in emissions due to leakage	
	Annual EgLKt tCO ₂ -e	Cumulative EGLK tCO ₂	Annual EAD LKt tCO ₂ e	Cumulative tCO ₂ e	Annual ΔCAD LKt tCO ₂ e	Cumulative ΔCAD LK tCO ₂ e	Annual ΔCLP MLKt tCO ₂ e	Cumulative ΔCLP MLK tCO ₂ e	Annual ΔCLKt tCO ₂ e	Cumulative ΔCLK tCO ₂ e	Annual ELKt	Cumulative ELK
2012	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0	0	0	0	0
2024	0	0	0	0	0	0	0	0	0	0	0	0
2025	0	0	0	0	0	0	0	0	0	0	0	0
2026	0	0	0	0	0	0	0	0	0	0	0	0
2027	0	0	0	0	0	0	0	0	0	0	0	0
2028	0	0	0	0	0	0	0	0	0	0	0	0
2029	0	0	0	0	0	0	0	0	0	0	0	0
2030	0	0	0	0	0	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	0	0	0	0	0	0

5.6 Summary of GHG Emission Reductions or Removal (CL2 & CL3)

Step 9.0. Ex ante total net anthropogenic GHG emission reductions

Step 9.1. Significance assessment

Only the carbon stored in the above and below ground biomass pools were considered by the project. While the above-ground pool is mandatory, the below-ground pool is optional but recommended by the methodology, since it represents between 25% of the carbon stored in above-ground biomass and is therefore a significant pool. Root-to-shoot ratios and data to estimate the carbon stocks in the below-ground biomass pool were taken from IPCC GPG (2003).

Step 9.2. Calculation of ex-ante estimation of total net GHG emissions reductions

The ex-ante estimation of total net GHG emission reductions to be generated through the project activity is calculated as follows:

$$\Delta REDD_t = (\Delta CBSLPAt + EBBBSLPAt) - (\Delta CPSPAt + EBBPSPAt) - (\Delta CLKt + ELKt) \quad \text{.....equation 8}$$

Where:

- $\Delta REDD_t$ *Ex ante* estimated net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t ; tCO₂-e ha⁻¹
- $\Delta CBSLPAt$ Sum of baseline carbon stock changes in the project area at time t ; tCO₂-e
- $EBBBSLPAt$ Sum of baseline emissions from biomass burning in the project area at time t ; tCO₂-e;
- $\Delta CPSPAt$ Sum of ex ante estimated actual carbon stock changes in the project area at time t ; tCO₂-e
- $EBBPSPAt$ Sum of (ex ante estimated) actual emissions from biomass burning in the project area at year t ; tCO₂-e
- $\Delta CLKt$ Sum of ex ante estimated leakage net carbon changes at year t ; tCO₂-e
- $ELKt$ Sum of ex ante estimated leakage emissions at year t ; tCO₂-e

Calculation of ex-ante Verified Carbon Units (Step 9.3 VM0015 v1.1)

The verified Carbon Units (VCTs) are calculated by subtracting the number of Buffer Credits (BCt) deposited in the VCS Buffer at time t ; t CO₂-e from *Ex ante* estimated net anthropogenic greenhouse gas emission reduction ($\Delta REDD_t$) attributable to the AUD project activity at year t ; tCO₂-e ha⁻¹ (equation 9)

$$VCUt = \Delta REDD_t - VBCt \quad \text{.....equation 9}$$

Where:

- $VCUt$ Number of Verified Carbon Units that can be traded at time t ; t CO₂-e
- $\Delta REDD_t$ Defined above

The Buffer for risk carbon unit are calculated by subtracting the total *ex ante* estimated actual carbon stock changes in the project area at year t ; tCO₂-e ha⁻¹ from the gross baseline carbon stock changes in the project area at year t ; tCO₂e and multiplied by Risk factor (equation 10). Ex-ante buffer credits are calculated based on a 15% risk factor estimated through the VCS non-permanence risk tool.

$$VBCt = (\Delta CBSLPAt - \Delta CPSPAt) * RFt \quad \text{.....equation 10}$$

Where:

- $\Delta CBSLPAt$ Sum of baseline carbon stock changes in the project area at year t ; CO₂-e
- $\Delta CPSPAt$ Sum of ex ante actual carbon stock changes in the project area at year t : CO₂-e
- RFt Risk factor derived obtained through VCS-approved AFOLU Non-Permanence Tool

Table 45. Ex ante net anthropogenic GHG emission reductions (ΔREDD_t) and Voluntary Carbon Units (Table 36, VM0015 v 1.1)

Project year t	Baseline carbon stocks		Baseline GHG emissions		Ex ante project carbon stock changes		Ex ante project GHG emissions		Ex ante leakage carbon stock changes		Ex ante leakage GHG emissions		Ex ante net anthropogenic GHG emission reduction		Ex ante VCUs tradable		Ex ante buffer credits	
	Annual ΔCBSLP_t tCO ₂ -e	Cum. ΔCBSLA tCO ₂ -e	Annual EBBB SLPtC O ₂ -e	Cum. EBBBA tCO ₂ -e	Annual $\Delta\text{CPS PA}_t$ tCO ₂ -e	Cum. $\Delta\text{CPSP A}$ tCO ₂ -e	Annual EBBPSA _t tCO ₂ -e	Cum. BBPSA tCO ₂ -e	Annual DCLK _t tCO ₂ -e	Cum. DCLK tCO ₂ -e	Annual ELK _t tCO ₂ -e	Cum. ELK tCO ₂ -e	Annual ΔREDD_t tCO ₂ -e	Cum. ΔREDD tCO ₂ -e	Annual VCU _t	Cum. VCU	Annual VBC _t tCO ₂ -e	Cum. VBC tCO ₂ -e
2012	2414153.351	2414153.351	2318057.35	2318057.35	-	-	1159028.68	1159028.68	0.00	0.00	0.00	0.00	1159028.68	1159028.68	985174.37	985174.37	173854.30	173854.30
2013	2367698.323	4781851.673	2273877.49	4591934.84	-	-	1136938.74	2295967.42	0.00	0.00	0.00	0.00	1136938.74	2295967.42	966397.93	1951572.31	170540.81	344395.11
2014	2323006.046	7104857.719	2231357.71	6823292.55	-	-	1115678.86	3411646.28	0.00	0.00	0.00	0.00	1115678.86	3411646.28	948327.03	2899899.33	167351.83	511746.94
2015	2279987.855	9384845.575	2190414.86	9013707.41	-	-	1095207.43	4506853.70	0.00	0.00	0.00	0.00	1095207.43	4506853.70	930926.31	3830825.65	164281.11	676028.06
2016	2238495.977	11623341.55	2150910.31	11164617.72	-	-	1075455.16	5582308.86	0.00	0.00	0.00	0.00	1075455.16	5582308.86	914136.88	4744962.53	161318.27	837346.33
2017	2198500.857	13821842.41	2112816.36	13277434.08	-	-	739485.72	6321794.58	0.00	0.00	0.00	0.00	1373330.63	6955639.49	1167331.04	5912293.57	205999.59	1043345.92
2018	2159884.275	15981726.68	2076022.11	15353456.18	-	-	726607.74	7048402.32	0.00	0.00	0.00	0.00	1349414.37	8305053.86	1147002.21	7059295.78	202412.16	1245758.08
2019	2122616.676	18104343.36	2040499.84	17393956.03	-	-	714174.95	7762577.27	0.00	0.00	0.00	0.00	1326324.90	9631378.76	1127376.16	8186671.95	198948.73	1444706.81
2020	2086609.397	20190952.76	2006166.40	19400122.42	-	-	702158.24	8464735.51	0.00	0.00	0.00	0.00	1304008.16	10935386.92	1108406.93	9295078.88	195601.22	1640308.04
2021	2051722.682	22242675.44	1972889.35	21373011.77	-	-	690511.27	9155246.78	0.00	0.00	0.00	0.00	1282378.08	12217764.99	1090021.36	10385100.24	192356.71	1832664.75
2022	1344487.427	23587162.87	1288590.93	22661602.70	-	-	257718.19	9412964.96	0.00	0.00	0.00	0.00	1030872.74	13248637.74	876241.83	11261342.07	154630.91	1987295.66
2023	1925507.638	25512670.5	1851684.80	24513287.50	-	-	370336.96	9783301.92	0.00	0.00	0.00	0.00	1481347.84	14729985.58	1259145.67	12520487.74	222202.18	2209497.84
2024	1894171.403	27406841.91	1821776.74	26335064.24	-	-	364355.35	10147657.27	0.00	0.00	0.00	0.00	1457421.39	16187406.97	1238808.18	13759295.92	218613.21	2428111.05
2025	1863778.403	29270620.31	1792758.74	28127822.98	-	-	358551.75	10506209.02	0.00	0.00	0.00	0.00	1434206.99	17621613.96	1219075.94	14978371.86	215131.05	2643242.09
2026	1834350.174	31104970.48	1764652.34	29892475.32	-	-	352930.47	10859139.49	0.00	0.00	0.00	0.00	1411721.87	19033335.83	1199963.59	16178335.46	211758.28	2855000.37
2027	1805776.515	32910747	1737352.85	31629828.17	-	-	347470.57	11206610.06	0.00	0.00	0.00	0.00	1389882.28	20423218.11	1181399.44	17359735.39	208482.34	3063482.72
2028	1778027.872	34688774.87	1710832.54	33340660.71	-	-	342166.51	11548776.56	0.00	0.00	0.00	0.00	1368666.03	21791884.14	1163366.13	18523101.52	205299.90	3268782.62
2029	1751096.227	36439871.1	1685085.23	35025745.93	-	-	337017.05	11885793.61	0.00	0.00	0.00	0.00	1348068.18	23139952.32	1145857.95	19668959.47	202210.23	3470992.85

203 0	1724849. 841	38164720. 94	165998 4.67	3668573 0.61	-	-	331996.93	12217 790.54	0.00	0.00	0.00	0.00	1327987.7 4	24467940. 06	1128789.5 8	20797749. 05	199198.16	3670191.0 1
203 1	1699361. 343	39864082 .28	163560 1.68	3832133 2.28	-	-	327120.34	12544 910.88	0.00	0.00	0.00	0.00	1308481.3 4	25776421. 40	1112209.1 4	21909958. 19	196272.20	3866463.2 1

5.7 Climate Change Adaptation Benefits (GL1)

While the economic and social impacts of climate change at the national level are difficult to estimate, the World Bank's study of the Economics of Adaptation to Climate Change indicates that climate change has the potential to reduce Ethiopia's GDP growth by 2-6% by 2015, with losses in the worst-case scenario rising to 10% by 2045

Some predictions and climate modelling at national level reported the following for Ethiopia ((Ethiopia Climate Resilient Green Economy, 2010):

- A rise in temperature of about 1.2°C by 2020s from 1961-2000 average
- A rise in temperature of 1.5-5.1 OC by 2090s from 1970-1999 average
- A decrease in the frequency of cold nights (linked to frost in dry season) significantly in all seasons
- A declining trend in the February to April short rains
- A slight increases in the June to August long rains, as well as in October and November
- An increase in flood events
- Losses of ecosystems/habitats and biodiversity, and the environmental services of forest areas;
- Lower river flows during dry season, which affects downstream community and hydropower generation;
- Increased drought and incidences of forest fires;
- Risk of the expansion of desertification in the highlands;
- Impacts on human health, due to increase in pollution, vectors and disease causing agent.

Generally, there is less confidence in rainfall projections and less convergence between models. But, most models projected a slight increase in average annual rainfall nationally, but with seasonal and regional differences, which may mean some regions might experience decreasing rainfall in certain seasons. The models broadly agree that more rain will fall in 'heavy events' – in increased volumes over shorter periods of time.

Given the dependence on rain-fed agriculture, these trends could have a negative impact on food security. The World Bank's study of the Economics of Adaptation to Climate Change (World Bank, 2010) indicates that climate change has the potential to reduce Ethiopia's GDP growth by 2-6% by 2015, with losses in the worst-case scenario rising to 10% by 2045.

The rising temperatures, changes in intensity and pattern of rainfall, increased incidences of flooding and landslide are factors stimulate the loss of ecosystems and the decline of local species in addition to making subsistence farming and/or family farming unattractive. Longer dry seasons and decrease in water supply to the pastoralist communities downstream may also lead to increase in duration of stay, and the number of human and livestock population that seasonally migrate to the highland forest. This in turn threatens plant and wild animal species, degrade forest quality that eventually lead to loss of the forest habitat, and livelihoods of the local forest dependent communities.

For instance, some preliminary studies indicated that the wild population of coffee might be lost from the Bale Mountains over the coming 4-5 decades. This may also significantly hamper the quality and quantity of coffee produced locally.

All Bale Eco-region carbon project activities are geared towards sustainable forest and land management that reduces deforestation, while improving livelihoods through increasing revenue for the community. Forests influence local microclimates, moderating extremes of temperature, which also has impacts on moisture regime. Vegetation cover also reduces runoff and flooding, and increase percolation of rainwater, which instead contribute to ground water recharge. These roles of forest are beneficial for the community and biodiversity.

The Bale Eco-region carbon project will encourage and support the local community to develop different organizational skills to improve forest and agricultural land management that optimizes conservation and sustainable use to adapt to climate change. These activities, aimed at mitigation and adaptation of local climate changes, include:

- Strengthening and empowering forest management cooperatives and their members;

- Strengthen and enhance the value chains of non-timber forest products and agricultural products through strengthening associations, cooperatives and unions;
- Continuously support selection and dissemination of crop varieties that are tolerant to drought and heat;
- Develop plans for land reclamation and reforestation;
- Promoting multi-storey agroforestry practices;
- Disseminate more sustainable silvo-pastoral practices (e.g. zero-grazing, cut-and carry, land zoning);
- Studies of economic and technological viability of prospecting and sustainable use of medicinal plants and other NTFPs;
- Promote sustainable ecotourism that benefits the local community;
- Support developments of other PES like watershed protection services to generate additional revenue to support local climate-resilient developments initiatives;
- Promote the use of new alternative income sources that are consistent with changes in local climate, primarily increased temperature and decreased rainfall.

6 COMMUNITY

6.1 Net Positive Community Impacts (CM2)

Without project scenario: In the current scenario (without project), the poor livelihoods situation of the Bale Mountains communities is a significant root cause of deforestation. The communities residing in and around the Bale Mountains forests are totally dependent on small-scale agriculture and livestock rearing. Therefore, they are forced to clear forestland to feed themselves and their families. As populations continue increasing this need for land also increases at alarming rates. Further they also cut forest trees for timber and fuel wood.

Without the project activities, expansion of agriculture and overgrazing by cattle is expected to continue since unsustainable use of natural resources including non-timber forest products (NTFPs) such as coffee and honey will not meet the demands of the community due to low market prices. Other external influences such as population increase, and drought, will also continue to contribute to increasing deforestation and forest degradation.

Fire is another incident that occurs regularly in the Bale eco-region. This requires much work in building capacity and awareness to create a system that will mitigate / reduce the incidence of fire.

In addition, the weak law enforcement and exclusion of local communities from managing and using the forest resources opens the way for illegal settlement in the forest and conversion to other land uses which also allowed the unsustainable exploitation of natural forest resources to continue.

As a consequence there will be increasing conflict between the original inhabitants of local communities and new settlers arriving from different parts of the country, as the new settlers try to convert the forestland to agricultural land at the expense of local peoples' forest based livelihoods. These new settlers also break the longer standing natural and less destructive relation between the environment and local community which weakens them as a group and compromises their traditional ways of life.

Regarding food security, recurrent drought challenges the livelihoods of local people. There has been scarcity of water for livestock and people in some lowland part of the project area. During such periods the people have been provided with food aid through the UN World Food Program. During the dry season they continue to use the forest resources unsustainably for themselves as well as their livestock.

Culturally there is also a loss of tradition due to new illegal migration of people from different parts of the country. The loss of traditional knowledge is expected to intensify due to continuous contact with and mixing of external cultural customs. There is also the risk of loss of traditional craft techniques and knowledge related to traditional medicinal plant species. With the reduced practice of traditional

knowledge, an even greater reliance on western medicine is expected and, consequently, complete loss of production systems and medicinal plant species may follow.

With Project Scenario: A significant improvement in quality of life of the Bale Mountains communities is expected once project implementation begins. The project aims to directly address the main factors that drive deforestation in the areas:

(i) The agricultural land expansion in the forest by the communities of Bale Mountains: the project will contribute to agriculture intensification and other alternative livelihood sources which causes them to seek activities that have higher added value (such as coffee, honey, medicinal plants, essential oils).

(ii) Fire: minimizing the fire incidence through awareness creation for community and establishing fire crew at different level, especially at community level,

iii) Illegal settlement: implementing strong forest law and settlement policy enforcement, and negotiating with various levels of governance to reduce the volume of illegal migration into the project area;

iv) Overgrazing: improving livestock production through introducing improved varieties of livestock, introducing market oriented livestock production than keeping large numbers for prestige.

The project includes the mapping of risks, threats and vulnerabilities in the areas in order to identify priority areas for action and strengthen the territorial protection. The boundary of the forest is clearly demarcated with specific areas identified and be monitored. Thus, it is expected that instances of unauthorized intrusion and illegal extraction of natural resources on forest land will reduce dramatically. Monitoring stations will also be installed and properly equipped so that the Bale Mountains forests can have better control and power to act in the face of events. A process of cooperation with local authorities for the conservation and protection of community-managed forest land will also be implemented. There will be training and capacity building in these activities.

A significant improvement in security and economic condition of the Bale Mountains communities is also expected. One of the main focuses of the project is to implement and foster the development of alternative income sources that are based on sustainable natural resources utilization to supplement household income and replace the income obtained from fuel wood collection and conversion of forestland to other land use. The development of productive chains of products already grown by the forest dependent communities is planned. Production of NTFPs such as coffee, honey, fish farming, medicinal plants, essential oils, and others will be supported through training and technical assistance, as well as structuring and marketing of local products.

Another line of action of the project is based on strengthening the JFM CBOs representative institutions. The goal is to improve the performance of the Bale Mountains forest management cooperatives before implementing many of the planned actions. Among the activities planned are those that will lead to stop drivers of deforestation as well as the acquisition of office equipment to support the CBOs in their implementation.

One area of high conservation value areas are forest areas whose value is due to its biodiversity, ecosystem richness, rare species, environmental services and the importance given by the local community to this area of forest and biodiversity. In the case of High Conservation Values (HCVs) related to social issues, we can highlight particularly those that are essential to meet the needs of local communities (e.g. subsistence, health) and those of extreme importance to the traditional cultural identity of local communities (areas of cultural, ecological, economic or religious significance, identified in cooperation with these communities).

Among the areas those that most directly affect social issues are medicinal values. The medicinal plants are abundant in the Bale Mountains and 90% of livestock and 80% of human depend on these resources. 40% of the medicinal plants in the country are found within the Bale Mountains.

The project will leverage a range of social and ecological benefits. From ecological perspective, the avoidance of this bio-rich tropical forests and improved management of it means the conservation of its biological diversity as ecosystem, species and genetic levels. Particularly the improved

conservation and protection of the moist evergreen montane forest system will contribute to the conservation of a unique gene pool of Arabica coffee in the south-eastern part of the country, which represents the only genetic pool of this world important plant species in this part of the country. Given the climate related risks to the species, conservation of this part of the forest increases chances of obtaining future climate adapted genetic material for the species. Besides, the forests in Bale Mountains are sites where one of the two bamboo species in Ethiopia, *Arundinaria alpine* species is located. Although the species is found in few other high altitude ecosystems of the country, the Bale Mountains forests are the only sites where the species is found in relatively intact and large size. Given its current and future potential including high carbon sequestration potential owing to its rapid growth, conservation of the forest and this species can offer high climate mitigation potential benefiting the global community.

Social benefits of the project could include boosting productivity of small holder agriculture the generation of new income sources based on sustainable alternatives, the creation of direct and indirect jobs in monitoring and land management activities, health improvement, and education. And enhance the capacity of the forest management cooperatives in sustainably managing the forests in their vicinity. Moreover, the local community by directly involving in the forest management through the right and responsibility they are granted through the JFM arrangement will benefit not only from the respected traditional access to the forest but also from improved sustainable utilization of products and services obtainable. A number of NTFPs have been identified, potential for marketing assessed, for some market already developed. Utilization of the NTFPs has been wholly given as rights of the community. From the REDD+ carbon credit as well agreement has been reached to allow the local communities to access the largest share (see supplementary material 24: Benefit sharing negotiation and agreement meeting minutes).

6.2 Negative Offsite Stakeholder impacts (CM3)

Adjacent to the BMERP, there are pastoral community who depends on livestock as a means of livelihoods. Traditional during dry season the community brings their livestock to the edge of forest for grazing. Under the project scenario the pastoral community continues using the area on the sustainable basis in the way that they will not also affect the resources negatively. This was stated in the participatory forest management (PFM) plan where the offsite stakeholders who had the traditional use right on the forest will be considered as secondary members.

The Bale Mountains Eco-region REDD+ Project is not expected to have negative social & economic impacts on the stakeholders. The implementation strategy of the project will be Participatory Forest Management (PFM) which will ensure participation of all identified stakeholders that are anticipated to be affected by the project activities. The activities will be carefully designed so that elite capture, one of the frequently identified potential threats, is properly addressed. Hence, PFM will be implemented in the reference area and is based on a participatory mapping exercise carried out with the different community members to identify and understand the various relationships that exist in the Bale Mountains Eco-Region – both within and outside the project area. This will ensure that all communities will have a net benefit as a result of the REDD+ activities.

The project will promote economic development based on sustainable use of natural resources which will include value addition on local products (e.g. forest coffee, honey, bamboo products) and market identification. Hence, the livelihood benefit from this project will further ensure benefit for communities outside the project area.

Furthermore, there will be monitoring system to ensure that the REDD+ project generates positive impacts and has a system to manage any potential negative impacts to offsite communities, such as illegal logging, deforestation etc.

If during the process any unexpected negative impact is identified. The issue will be discussed between OFWE and the affected community representatives to address and solve the issue immediately.

Overall the areas and communities adjacent to the project area will benefit from the conservation and sustainable use of natural resources that will be promoted by the project to avoid potential negative impacts.

6.3 Exceptional Community Benefits (GL2)

The project demonstrably qualifies for Gold Level for its exceptional community benefits, because the comprehensive set of community approaches will effectively bring benefits to the poorer sections of the local community, in a country which is itself one of the poorest in the world.

The following issues are addressed in turn below.

1. Project zone is in a low human development area

Ethiopia's HDI value for 2013 is 0.435— which is in the low human development category— positioning the country at 173 out of 187 countries and territories, according to the UNDP Human Development Report. The BMERP area does qualify as the group of rural areas that includes Bale, the project zone.

2. Benefits for people in the lowest category of well-being

The experiences drawn from an earlier and on-going participatory forest management (PFM) practices reveal that deforestation can only be better counteracted if the needs and the rights of the local people are taken into account. PFM as part of the REDD+ activities will ensure the poorest households and marginalized groups such as women headed households are included within the CBOs that will implement the project activities along with OFWE.

The project will engage the local communities living in and surrounding the forest in design and implementation of REDD+ strategies. It is based on clear understanding of forest-related dependencies on vulnerable groups and the potential impact that REDD-plus activities could have on the livelihoods of vulnerable groups, including local community at large. It will empower women in governance and improve their access to resources.

The contributions to marginalised groups through the planned activities of conservation, sustainable management and restoration of forest resources will strengthen through REDD-plus interventions. The environmental and social co-benefits from the REDD+ project and their impacts on vulnerable communities and also their potential contributions will be taken into account.

Removal of barriers to prevent such benefits going to poorer households

The barriers to the local community were identified as the low participation of the rural women and the poor of poor. However, the project designed strategy to increase women participation where even, the project conducted women only meetings, including FPIC.

7 BIODIVERSITY

7.1 Net Positive Biodiversity Impacts (B2)

The Bale Mountains is the most important component of the Ethiopian Highlands Conservation International (CI) Hotspot, within the Eastern Afromontane Hotspot (PASP, 2005). The Bale Mountains have one of the highest incidences of animal endemism of any terrestrial habitat in the world, with 160 endemic species of flowering plants and is the most important area of high conservation values in the Ethiopian highland. It constitutes part of Conservation International's Eastern Afromontane Biodiversity Hotspot Area, and is one of the 69 Important Bird Areas (IBAs) designated in the country, harbouring about 280 bird species, of which six are endemic, seven are globally threatened and 42 out of 48 Afro-tropical highland biome bird species (88% of the total in the country).

Compilations of previous studies show at least 78 mammal species, belonging to nine orders and 23 families of mammalian groups, are known to occur in the Bale Mountains Eco-region. Twenty (26%) of the total species are reported to be endemic to Ethiopia representing 40% and 67% of the total mammal species and endemics, respectively, occurring in the Ethiopian highlands. Furthermore, at least five species are presumed to be confined to the Bale Mountains area while another five species are locally endemic.

Under the “without project” scenario, 32.2 %of the Bale mountains forest will be lost by 2031. The loss of forest cover implies a loss of biodiversity and habitat for local flora and fauna, as well as the environmental services that the forest provides. This loss of forest also directly affects the conservation of the soils and disturbs the ecological processes on a larger scale .

The “with project” scenario assumes that the resources required to guarantee forest conservation and sustainable development are available from emissions reductions payments. Under this scenario, it is assumed that the forests in the project area will be conserved and thus will promote great benefits in terms of biodiversity conservation when compared to the “baseline” scenario.

In addition to these benefits, the project will make possible the establishment of a robust system for biodiversity monitoring and research of the natural resources in the Bale Mountains Eco-region and its surroundings. This system is based on the “Biodiversity and Natural Resource Use Monitoring Program in the Oromia State (OFWE). The importance of involving local communities and their role in maintaining the integrity of the ecosystem will be highly encouraged through Participatory Forest Management (PFM).

The main positive net impacts that the monitoring of the biodiversity will bring to the project area are shown in the table 46 below. As shown, without biodiversity monitoring, it is impossible to gather information that allows better management and conservation of the biodiversity.

Table 46: Net Positive impacts on the biodiversity

Area	Situation Without the project	Program/Activity	Net Benefits	Indicators	Budget	Institution
Biodiversity monitoring	No monitoring of biodiversity	PFM involving communities in monitoring biodiversity	Help with the prevention and identification of negative impacts on biodiversity and on the livelihood of the communities	Data collected regularly and documented		OFWE

The Bale mountains REDD+ project will slow and halt the current process which is placing rare, threatened or endangered species under extreme threat. The project is set in Afromontane humid and dry forest ecosystems housing diverse wild Arabica coffee, and other endemic flora and fauna populations. No invasive species have been/will not be introduced in the natural forest area. It envisages enhancing wild coffee production from the existing natural forest while promoting marketing of coffee beans at premium price. The project also encourages sustainable production and harvesting of Non Timber Products (NTFPs) to compliment the livelihood of the local community. Ecotourism will also be considered as an option to livelihoods diversification of the local people.

In the Bale Mountains Eco-region, the communities grow exotic species at the vicinity of their villages/farms as boundary plantings or woodlots while the Oromia Forest and Wildlife Enterprise grows industrial exotic plantations of *Cupressus lusitanica* and Eucalyptus species. The plantations

are meant to meet the ever increasing demand of the local community for wood and thereby reduce pressure on the natural forest. These activities are already included in the “with project” scenario although they may seem to represent a possible situation with a potential for causing negative effects. The application of appropriate silvi-cultural practices can inhibit the proliferation of diseases and pests that may threaten the nearby forest. The OFWE, together with relevant institutions, will train the local communities with preventive measures. Genetically modified organisms will not be used in anyway in the project area.

7.2 Negative Offsite Biodiversity Impacts (B3)

There are no anticipated negative environmental or biodiversity impacts from project implementation. The Bale Mountains Eco-region REDD+ Project is not expected to have negative offsite biodiversity impacts. It is actually expected to result in increased conservation value to an area that is globally significant. The project will secure the protection of the natural forests and hence the natural resources within the Bale Mountains will be conserved. The forest management plans that are developed through the PFM process ensure that each forest compartments have a carefully designed plan that will ensure a positive impact in the forest and hence the biodiversity.

The overall project area includes the entire Bale massif except the National Park. Hence none of the areas that are significant in biodiversity conservation are left out in this process. In addition, the work to be done will support the effort of the National Park by introducing a sustainable natural resources management system around the park and hence reducing / removing threats that were faced by the area.

The project will promote economic development based on sustainable use of natural resources which will increase the value of the resources in the area and ensure their conservation as well. Furthermore, there will be monitoring system to ensure that the REDD+ project generate positive biodiversity impacts as well as a system to manage any potential negative impacts to offsite biodiversity. If during the process any unexpected negative impact is identified. The issue will be discussed between the stakeholders to address and solve the issue immediately.

7.3 Exceptional Biodiversity Benefits (GL3)

Ethiopia has a large number of species listed as critically endangered, endangered and vulnerable to global extinction. The threatened species in Ethiopia can be broken down into three categories (based on IUCN ratings): Critically Endangered, Endangered and Vulnerable (Massicot, Paul 2005). In the table below (Table 47) Mountain Nyala, Ethiopian Wolf, African Wild dog, harena shrew and others, which are found in the project area, falls in one of these three categories. This implies implementing the project and improving the management of the eco-region will help save and sustain the lives of these endangered species and their ecosystem functions.

Table 47. List of fauna species in Bale eco-region at various level of threat
<http://www.animalinfo.org/country/ethiopia.htm>

Critically endangered mammals^[118]	Endangered mammals	Vulnerable mammals		
Bilen gerbil	Grevy's zebra	African elephant	Large-eared free-tailed bat	Red-fronted gazelle
Black rhinoceros	Mountain nyala	Ammodile	Lesser horseshoe bat	Rupp's mouse
Ethiopian wolf	Nubian ibex	Bailey's shrew	Lion	Scott's mouse-eared bat
Guramba shrew	African wild dog	Bale shrew	Moorland shrew	Soemmerring's gazelle
Haremma shrew		Beira antelope	Morris's bat	Speke's gazelle

MacMillan's shrew		Cheetah	<u>Mouse-tailed bat species</u>	Spotted-necked otter
Walia ibex		Dibatag	Natal free-tailed bat	Stripe-backed mouse
		Dorcas gazelle	Nikolaus's mouse	
		Glass's shrew	Patrizi's trident leaf-nosed bat	

The Bale Mountains are unique in Africa and encompass Africa's largest alpine plateau which contains the largest populations of two of Africa's least known and yet most charismatic species – the Ethiopian wolf and the Mountain Nyala (Figure 60). Bale Mountains also harbour an exceptionally high number of other species endemic to Ethiopia and, in some cases, endemic to the Bale Mountains themselves. They are included in Conservation International's Eastern Afrotropical Biodiversity Hotspot (one of 34 such critical eco-regions for biodiversity conservation in the world) and are designated as one of BirdLife International's Important Bird Areas.



Figure 60: Endemic Mountain nyala - male

Among the larger mammal species of the area, five deserve special conservation attention since they are not only endemic and/or globally threatened, but are also important flagship species for the Ethiopian highlands. These include the endangered endemic Bale monkey (*Chlorocebus djamdjamensis*), Ethiopian wolf (*Canis simensis*) and Mountain nyala (*Tragelaphus buxtoni*), as well as the endangered Wild dog (*Lycaon pictus*) and the Ethiopian lion (*Panthera leo*) (Figure 61) which has recently been recognized as genetically different from other lion in East Africa.



Figure 61. Ethiopian lion with unique black mane – Hareenna forest area

Around 78 species of mammals are recorded in Bale, which represent 40% of mammals known from the whole Ethiopia. Out of these, 20 species are Ethiopian endemics, representing 26% of the total species reported in the area. This is by far the highest proportion of endemics. On average, about 10% of the flora and fauna of Ethiopia are endemic. The endemic mammals of the Bale Mountains also 67% of the total endemic mammals recorded in the Ethiopian highlands. Isolation and rarity put these endemic species at high risk of extinction and, thus, in need of effective conservation strategies that are supported nationally and internationally. Not only does this area protect a significant portion of Ethiopia's and the world's biodiversity, it is also an area with immense benefits for species evolutionary processes.

However, the current trend of ecological degradation in the area poses a severe threat to the survival of most of these rare species. It has even been said that "if conservation efforts are not successful and people continue to exploit the resources in an unsustainable way, more species of mammals would go extinct than any area of equivalent size on the globe."

Hence the work that is envisaged to be carried out by the REDD+ project over the whole Bale Mountains area will no doubt have an exceptional biodiversity benefits while placing a sustainable natural resources management system in an area with such global significance.

There are seven globally threatened species of birds recorded in the Bale Mountains. These include four vulnerable species (Greater Spotted Eagle, Imperial Eagle, Lesser Kestrel and Wattled Crane), and three near-threatened species (Pallid Harrier, Rouget's Rail, and Abyssinian Longclaw). The 6 endemics out of the total 16 Ethiopian endemics are: Spot-breasted Plover, Yellow-fronted Parrot, Abyssinian Longclaw, Abyssinian Catbird and Black-headed Siskin. The Spot-breasted Plover population is the largest and most significant for the species, and hence deserves conservation on its own.

8 MONITORING

8.1 Description of the Monitoring Plan (CL4, CM4 & B4)

This monitoring plan outlines the methods to be used for assessing the net climate, community, and biodiversity benefits achieved during the BMERP implementation periods. Measurement of progress toward the achievement of community and biodiversity objectives follows guidance from the CCBA Social and Biodiversity Impact Assessment Manual for REDD+ Projects (Richards & Panfil, 2011), and subsequent community and biodiversity assessment specific guidance by Richards (2011) and Pitman (2011). The monitoring of climate benefits follows the requirements of the VCS VM0015, V1.1 Methodology.

The Social and Biodiversity Impact Assessment Manual for REDD+ Projects (Richards & Panfil, 2011) defines monitoring as “a continuing process that uses systematic collection of data to show the achievement or progress of project objectives and to feed information back to project management in order to improve operational effectiveness.” The purposes of the BMERP REDD+ monitoring program align with this definition and include the assessment of potential negative outcomes to allow for their prompt and adequate responses.

Objectives

The BMERP set out the following objectives:

- Measure progress toward the achievement of climate, community, and biodiversity objectives.
- Assess for potential negative and/or unexpected outcomes or impacts that result from the project.
- Provide feedback for continual improvement through.

For community and biodiversity impact assessment, Richards and Panfil (2011) recommend the *theory of change* approach (also known as the *causal model*) above other known methods as a credible and cost-effective means of assessing impacts for REDD+ projects. The theory of change approach, through an analysis of anticipated cause and effect sequences from project activities through to outcomes and eventual long-term impacts, allows for a systematic evaluation of how project interventions are expected to achieve their desired objectives. The resultant conceptual or causal model is common to monitoring and evaluation approaches (e.g., results-based management, logical framework) used by public agencies as well as international development agencies and NGOs. Measurement of progress toward the achievement of climate objectives, as noted above, follows the requirements outlined in VCS VM0015: Methodology for Avoided Unplanned Deforestation, version 1.1.

Organizational Structure, Responsibilities and Competencies:

Various agencies are involved with differing but reinforcing responsibilities in the BMERP. The responsibilities and competencies of each of those involved are described as follows:

Oromia Forest & Wildlife Enterprise (OFWE) /Farm Africa/SOS Sahel Ethiopia: During the first five years of the project, the project proponent (OFWE) supported by Farm Africa/SOS Sahel Ethiopia, will be responsible for managing, outsourcing and collecting the results of (1) biomass inventory measurements, (2) social assessments, (3) recording activity implementation, and (4) any other data required to be monitored under the methodology VM0015, V1.1. OFWE will execute first-pass of quality assurance and quality control (QA/QC) checks on all of the data collected by them or any other partner. OFWE will keep records of all field inventory and social appraisal data sheets and all other evidence demonstrating the correct execution of project implementation.

After the first five years of the project, OFWE will conduct field inventory measurements, and review the monitoring reports. OFWE will be trained to become the responsible party for all monitoring requirements five years after the project.

Joint Forest Management CBOs (JFM CBOs) and Development Agents: Report natural disasters and challenges related to forest protection, reports drivers of deforestation and suggested changes to project actions. The communities JFM CBOs have the responsibility to carry out project actions where appropriate.

Managing Data and Ensuring Data Quality

Data quality will be maximized and ensured during all aspects of the monitoring process by quality assurance and quality control (QA/QC) procedures. To monitor field inventory data, data analysts, and involved individuals/institutions in evaluating the quality of analytical data, rigorous QA/QC procedures relevant to this project are developed. The QA/QC procedures include specific criteria to evaluate the quality of analytical data that has been gathered. The QA/QC procedures are therefore an essential part of monitoring BMERP.

Procedures for Handling Internal Auditing and Non-conformities

The BMERP involves a wide range of stakeholders at village, community, woreda, zone, region and national levels. The success of this long-term project depends on the ability of the stakeholders to effectively and harmoniously resolve any problems and issues that arise during implementation. As such, the project has developed policies and procedures providing guidance to project stakeholders on how to resolve resolving complaints and grievances.

Project Stakeholders may raise complaints and grievances to the BMERP governance body either verbally or in writing. The governance body is obliged to resolve.

Below are some detail description of the Monitoring Plan:

TASK 1: Monitoring changes in carbon stocks and GHG emissions for periodic verification (CL30).

1. Monitoring actual changes in carbon stocks and GHG emissions in the project area;
2. Monitoring leakage;
3. Ex-post calculation of GHG emission reductions;
4. Monitoring the impacts of natural disturbances and other catastrophic events.

1. Monitoring actual changes in carbon stocks and GHG emissions in the project area

This will be achieved through monitoring the following parameters:

1.1. Monitoring the implementation of the project

This task will be primarily the responsibility of Oromia Forest and Wildlife Enterprise (OFWE) and Joint Forest management Cooperatives (JFM CBOs). There are also other project partners who will be involved in the implementation of the project on the ground, such as Oromia Bureau of Agriculture through its grass-root level development agents, Oromia Cooperative Promotion Agency(OCPA) which is working with JFM CBOs will be involved in the project activities implementation monitoring tasks. During the first 4/5 years of the project period, Farm Africa & SOS Sahel Ethiopia will be involved in the project implementation monitoring to support the proponent and local communities and delivering the capacity building training for both organizations.

The activities implemented within the project area will be monitored continuously. Financial and technical reports will be submitted for project activities. During project activities implementation, particular importance is the implementation of the surveillance system that will allow continuous monitoring of the area to halt entry of potential illegal settlers and encroachers for agricultural land expansion and fuel wood collection.

As the smaller unit of the BMERP area is kebele, more effort will be made at this point to effectively reduce deforestation. In all the kebeles of the project areas, three responsible bodies exist to closely work together to implement and monitor the project activities implementation. These are:

- **JFM CBOs:** these are bodies organized and signed an agreement of joint forest management with government to share roles and responsibilities of forest conservation as well as sharing revenue from the forest. Under each JFM CBOs in the project areas' kebele, there are a compartment

committee /community groups who will be responsible for day to day monitoring of their compartment for illegal cutting of trees, fire... Reports from the compartment will be submitted to the JFM CBOs' executive committee for appropriate measures and /or reports to the kebele administrative body to take legal actions.

- **Development Agents (DA):** There are 2-3 persons employed by the Oromia BOA to support the community in any development work in the kebele, including the forest protection activities.
- **Kebele Administration (KA):** This is the smaller unit of government administrative body in each kebele. This body helps the BMERP in all aspects of political support to the JFM CBOs particularly in law enforcement.

Maps, reports and records will be available to VCS/CCB validators at each validation event.

1.2. Monitoring change and land use within the project area.

This will be the responsibility of OFWE, Farm Africa and SOS Sahel Ethiopia (during the first 4-5 years) and will be conducted according to the description of deforestation monitoring outlined above, and will generate the corresponding parameters contained in Appendix V of the Methodology VM0015 v 1.1.

The project will use medium resolution LANDSAT satellite imagery to generate annual deforestation data throughout the Reference Region of the project, using the supervised classification of images according to the Methodological LUC Annex. This analysis will generate classes of non-forest and forested areas, updated every year, and will be compared with previous years. Deforestation estimates obtained from this analysis will be compared with the deforestation baseline values that were obtained from historical deforestation period, which was generated by the *Dinamica EGO model*, of the Reference Region (2000-2011), defined as the baseline scenario in the region of interest.

1.3. Forested areas where the carbon stock is increasing.

As the project proponent is not accounting for the carbon increase, this will not be included in the monitoring

1.4. Monitoring of the impacts of natural disturbances and other catastrophic events.

If there are catastrophic events during the project lifetime, these will be evaluated and reported for the project area if they are significant. Monitoring will follow tables 25.e, 25.f, 25.g to report reductions except in case of forest fires, where the tables 23 and 24 of the VM0015 v 1.1 will be used.

2. Monitoring leakage

Based on the methodology VM0015 v 1.1, the following will be monitored:

2.1. Reduction of carbon stocks and GHG emissions due to activity shifting leakage.

This project is not expected to cause any kind of leakage as it is carefully planned to be managed through established Leakage Management Area/s (LMAs). In any case, deforestation will be monitored annually throughout the Reference Region, including the leakage belt. If some deforestation occurs in the leakage belt during the project period, the loss of carbon stocks will be accounted for using the current values of carbon stock per hectare of the forest class in question, and will be deducted from the non-permanence buffer.

The project will monitor leakage throughout the Leakage Belt using remote sensing techniques in all verification events. Also, JFM CBOs, DAs and Kebele administrators will survey boundaries *in loco* during the whole period of the project.

3. Total estimates ex-post leakage.

Results are presented in the same way as the *ex ante* estimation of leakage.

4. Anthropogenic GHG reductions ex post.

As per the methodology VM0015 v 1.1, the same procedure will be used as to calculate *ex-ante* emissions, except the *ex post* estimates of changes in carbon stocks and GHG emissions should be used in the case of leakage in the project scenario.

Increases or reductions of GHG associated with preventive measures for leakage will not be monitored since stocks contained in the leakage management area are not significant.

TASK 2: Revisiting the projected baseline at fixed periods.

1. Update information on agents, drivers and underlying causes of deforestation

The variables used to project future deforestation from the reference region will be reviewed at 10-year fixed periods. Information regarding the biophysical variables, agents, vectors, and the underlying causes of deforestation will be updated (Step 3) of the methodology VM0015 V 1.1.

2. Adjust the component of use and land-use change of the baseline.

Step 4 of Part 2 of the methodology VM0015 v 1.1 will be repeated to consider the 10-year period in the Reference Region (2012-2021).

Updating the baseline scenario will take place on the spatial component that defines the distribution of deforestation. Key variables that will be used to recalculate the baseline in the second 10-year period of the project are: Spatial: road map, distance to urban areas and distance to new sites of deforestation.

To collect this information, field visits will be made where questionnaires and discussions will be held *in situ* that will elucidate new land use dynamics. OFWE will be responsible for carrying out this part of the monitoring.

3. Adjusting the carbon component of the baseline.

The carbon component of the baseline will be revised according to data monitored in item 1.3 of Task 1 of this monitoring plan.

Description of the initial plan for selecting community and biodiversity variables to be monitored (CM4.1 & B4.1)=

CM4. COMMUNITY IMPACT MONITORING

The community project activities will be monitored using the “Theory of change” method as described within the CCBA Standard’s Social and Biodiversity Impact Assessment guidelines. It is anticipated that larger impacts will be visible in the long term. Therefore, the monitoring of these activities will rely on Outputs and Outcomes as shown in the below diagram.



Community socio-economic monitoring

The methodology used to define the expected socio-economic impacts of the Project on the Bale Mountains communities, as well as the selection of indicators and building a plan to monitor these indicators will be based on the “*Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects, Part 2 – Social impact assessment manual*”.

Information on current community conditions was collected to establish baseline using the following indicators: community based institutional capacity, household income from forest based natural products such as honey, coffee...). The baseline was established using a household survey, individual HHS interview, group discussion and PRA tools.

The methodology will feature periodic social assessment consisting of household surveys to measure the quantitative impacts on local communities, Participatory Rural Appraisals (PRA) and Theory of Change's activities, outputs, outcomes and community impacts to measure the qualitative impacts against the baseline. Whereas the household survey is semi-structured and will test a stratified randomized sample of community members in the Project Zones (participants and non-participants alike) based on socio-economic variables, the participatory rural appraisals and focus groups provide a targeted, purposive sample of Project participants. Using an open-ended, participatory approach, the participatory rural appraisals and the focus groups also provide the opportunity for an in-depth exploration of issues relevant to community members.

The Bale Mountains REDD+ Project (BMERP) has developed organizational capacity assessment tool (OCAT) through which the capacity gaps of the Joint Forest management CBOs will be identified

for future support strategy. The tool was developed to be used by the government and project staffs for the JFM CBOs capacity assessment to identify and improve the capacity of CBOs in the areas of institutional management, forest management, skills in the REDD+ areas. Trainings will be provided to government partners and project staffs on the how to use the tool for the capacity assessment purpose.

Selecting community Variables to be monitored (Table 63)

The communities in the project zone will be involved in participatory monitoring activity through 5 committee members, each nominated by the general assembly of each village to represent them, to assess the extent to which the planned project activities are benefiting the community and achieving project objectives. For the community's socio-economic impact monitoring, the following variables will be monitored:

1. Social indicators
2. Economic indicators;
3. Institutional indicators;

All methods will rely on community input regarding project impacts. Parameters to be measured will include:

- community member knowledge and attitudes related to the Project, especially levels of participation of women and youth groups;
- changes to forest related income and as the result of project activities implementation;
- institutional capacity to manage natural resources, institutional management and finances;
- improvements in forest ecosystem;
- Changes in carbon stock levels and forest conditions.

The data will be collected through community focus group discussions, in-depth interviews, and sample surveys. There will be annual participatory assessment which will be supplemented by field trip reports and the minutes of meetings facilitated by the project proponent and the NGOs working with the project communities. Longer term measurement of the impact of the Project on local communities will be gathered through periodic sample surveys conducted with Project proponent. These surveys will cover a range of issues including income, and employment, education, social capital, and resource availability and will be used to quantitatively measure socio-economic changes in the Project communities.

Table 48. Monitoring plan for Bale Mountains Eco-Region REDD+ project

Parameters to monitor	Unit	Data to be collected	Monitoring frequency	Method of monitoring	Responsible body	Quality control and quality assurance procedures.	Data archiving
Monitoring actual changes in carbon stocks in the Project Area and leakage belt	tCO ₂ e	Above ground biomass (change)	Every five years 50% of permanent sample plots will be re-inventoried	Field forest inventory of permanent sample plots	OFWE (silviculture unit) and Forest managing community CBOs jointly	10% of the sample plots will be assessed by a separate team of experts and results will be cross-checked	OFWEE database/Farm Africa/SOS sahel archive
Area of deforestation in PA	ha	Area of forest deforested compared to the baseline	Every year	Using satellite imagery of the same season (dry season) as used in the baseline case assessment	OFWE GIS unit	Ground truthing by taking sufficient number of GCPs	OFWE GIS unit/Madawellabu university
Area of deforestation in the leakage belt	ha	Area of forest deforested compared to the baseline	Every year	Using satellite imagery of the same season (dry season) as used in the baseline case assessment	OFWE GIS unit	Ground truthing by taking sufficient number of GCPs	OFWE GIS unit/Madawellabu university
Area within the Project Area affected by catastrophic events in class <i>icl</i> at year <i>t</i>	ha	Area affected by natural catastrophes	Each five year and during each event	Observation	OFWE	Ground surveying by two different expert teams	OFWE and Madawolabu university
Areas affected by forest fires in class <i>icl</i> in project area	ha	Burnt area and extent of carbon loss	After each fire event	Remote sensing plus ground survey	OFWE	Ground survey by independent	OFWE and Madawolabu university

and leakage belt at year <i>t</i>						team of expert	
Ex-post calculation of net GHG emission reduction	tCO ₂ e	Calculate cumulative carbon stock changes in PA and LB under project scenario verse the baseline projection	Every five year	calculate	OFWE	-	OFWE
Revisiting the projected baseline at fixed		Re-check the baseline case after 10 years since project start date and adjusting the carbon component	10 years	Investigate/calculate (forest inventory plus remote sensing GIS combined)	OFWE	validate	OFWE
Community forest income change	Birr/hh/yr	Household economic data collection using randomly selected sample households and compare this with baseline income level	Every five year	Comparative analysis of household income (income accounting using such tools like PRA)	OFWE	Independent studies in the eco-region by various organs (literature verification)	OFWE
Community institution forest management capacity assessment	-	Analyze capacity gaps and capacity building needs or performance assessment	Every two year	Using a tool developed for the region called (OCAT= Organizational capacity Assessment Tool)	OFWE		OFWE

Monitor community attitude and perception on the project		Socio-economic survey	Every two year	Using PRA techniques	OFWE		OFWE
Biodiversity condition of the area	Species abundance of indicator plants and animals (those identified as threatened species such as <i>Coffea Arabica</i>)	Field inventory	Every five year	Using biodiversity assessment field inventory	OFWE	Literature study/other sources of information	OFWE

Furthermore, the project proponent (OFWE) and its supporters (Farm Africa/SOS Sahel) express commitment to draw a comprehensive community and biodiversity monitoring plan within 12 months after validation of the PDD.

Assessing Effectiveness of High Conservation Value Monitoring

Special attention will be given to HCV areas specific to meeting community needs, including areas with *Coffee (coffea Arabica)* which is naturally growing in the Bale Mountains Natural forest and contributes a lot to the household economy in the area. The project supports the local community owning the wild coffee in the BMERP area to sustainably use the coffee for their livelihood improvement. There are also numerous natural mineral water springs, locally called *horas*, which provide an essential source of minerals for livestock. The mineral springs within the the BMERP area are valued for their high mineral content (sodium, magnesium, zinc and calcium), and local pastoralists believe that in order to maintain good health and milk production their livestock must be given *hora* water. They will drive their livestock for up to two days to reach the *hora* springs. The project will conduct participatory monitoring of the impact of the project activity on horas every year

Data on HCV areas will be collected through community focus group discussions, in-depth interviews, and field surveys within the HCV area. The effectiveness will be assessed by HCV areas not being negatively affected by Project implementation over time and further monitored by reviewing interviews of community members over time.

Communication Plan of Monitoring to Communities and Other Stakeholders

On-going Communication

a. Internal Communication plan

Beyond the consultation process prior to the start of activities, the Project also plans to implement a plan for ongoing communication and conflict resolution mechanisms, to ensure that those involved directly or indirectly in the project have a chance to express their needs, suggestions and help in resolving potential conflicts.

Thus, the BMERP will implement ongoing communication with the goal of maintaining an open and accessible channel for dialogue between project implementers and beneficiaries that also aims to ensure feedback to the project from relevant comments and suggestions that may arise during the phases of development and implementation of activities.

To accomplish this, "local community agents" (JFM CBOs leaders, Kebele Administrators, OFWE staffs) will be trained to receive comments that arise from the stakeholders and share them to project managers. These comments will also be incorporated in regular reports that will be available at OFWE headquarters. Project proponents and partners will also report to the stakeholders about possible changes due to comments, criticisms and suggestions that emerge, and will communicate to the authorities when there are infractions of the rules and regulations of the project.

In addition, awareness raising, field inventories, meetings between communities and other stakeholders, workshops, the status of project activities and other relevant information and activities will be constantly updated and disseminated through reports and technical notes available on the internet at the institutional website and that of implementing partners.

During the CCBA public consultation period, the Project Description (PDD) will be available and accessible to local communities and other relevant actors in the project (in Amharic and / or Afan Oromo). To ensure that everyone has access and opportunity to comment on the project, this document will be available on the website of OFWE and project partners. To facilitate access of other groups, there will also be hard copies available and meetings in the Kebele Administrations to receive their comments.

External Communication Plan

The results of the monitoring plans presented in this document will be available, through executive summaries, on OFWE, Farm Africa and SOS Sahel websites for external stakeholders. Hard copy will also be distributed to external partners who wanted to know and comment

b. **Plan to launch the project and resolve of conflicts and non-conformities**

To ensure communication with actors involved both directly and indirectly in the project, there is a plan to launch the project and resolve conflicts and non-conformities that may arise with the implementation of project activities.

8.2 Data and Parameters Available at Validation (CL4)

Data Unit / Parameter:	Deforestation Dry evergreen Forest
Data unit:	Hectares
Description:	The annual area of Dry evergreen forest converted to non-forest vegetation.
Source of data:	Analysis of landsat images of 2000, 2005, 2009 and 2011 available in GIS data files and Methodological LUC Annex
Value applied:	10,738.9 ha/year Average annual deforested area on the historical reference period (2000-2011).
Justification of choice of data or description of measurement methods and procedures applied:	Deforestation will be measured using the same steps of the Methodological steps used and presented in the LUC Annex for the PDD (and Forest Cover Benchmark Map (2011) to obtain annual increments in classes of non-forest land in the period 2001-2011. Using the same land use matrix with Remote Sensing and GIS Techniques, the analysis for land cover change will be performed using medium resolution imagery with some high resolution imagery for and ground truthing data for verification
Any comment:	See Methodological LUC Annex

Data Unit / Parameter:	Deforestation moist Forest
Data unit:	Hectares
Description:	The annual area of moist forest converted to non-forest vegetation.
Source of data:	Analysis of landsat images of 2000, 2005, 2009 and 2011 available in GIS data files and Methodological LUC Annex
Value applied:	5,429.6 ha/year Average annual deforested area on the historical reference period (2000-2011).
Justification of choice of data or description of measurement methods and procedures applied:	Deforestation was measured using the steps described on the Methodological LUC Annex for the PDD, including the Forest Cover Benchmark Map (2011) to obtain annual increments in classes of non-forest land in the period 2000-2011 (time-steps 2000-2005-2009-2011). Using the land use matrix with Remote Sensing and GIS Techniques. The analysis for land cover change was performed using medium resolution imagery with some high resolution imagery for and ground thruthing data for verification.
Any comment:	See Methodological LUC Annex

Data Unit / Parameter:	Carbon stock in Dry Forest aboveground biomass
Data unit:	tons C/ha or tons CO ₂ e/ha
Description:	Dry Afromontane forest is one of the forest strata identified in the Bale Eco-region. The above ground

	biomass refers to the carbon stock in the woody live vegetation in this forest stratum.
Source of data:	Forest inventory for DBH in combination with global allometric equation and national Wood Density data.
Value applied:	99.71 tC/ha
Justification of choice of data or description of measurement methods and procedures applied:	Forest inventory was conducted to determine the biomass carbon stocks. A nested 1 ha plot size was laid and dendrometric parameter of trees within the plots (DBH) was measured including tree species identification. Then Chaves et al., 2005 allometric equation was applied with national/Regional WD value to estimate biomass, with carbon stocks per tree estimated to be approximately 0.5 of the biomass based on IPCC good practice guide.
Any comment:	See Bale Forest Inventory Report and Bale carbon stocks assessment manual

Data Unit / Parameter:	Carbon stock in Moist Forest aboveground biomass
Data unit:	tons C/ha or tons CO ₂ e/ha
Description:	tons of carbon per hectare in aboveground biomass within the Moist Forest class (stratum) in the BALE Eco-Region
Source of data:	Forest inventory conducted as above
Value applied:	176.54 tC/ha
Justification of choice of data or description of measurement methods and procedures applied:	Forest inventory was conducted to determine the biomass carbon stock in the moist forest stratum of the eco-region. A nested 1 ha plot size was laid and dendrometric parameter of trees within the plots (DBH) was measured including tree species identification. Then Chaves et al., 2005 allometric equation was applied with national/Regional WD value to estimate biomass, with carbon stocks per tree estimated to be approximately 0.5 of the biomass based on IPCC good practice guide..
Any comment:	See Bale Forest Inventory Report and Bale carbon stocks assessment manual

Data Unit / Parameter:	Mean Wood density of species
Data unit:	gram/cubic centimetre (g/cm ³)
Description:	Average basic wood density for major species in Bale eco-region
Source of data:	Data on basic wood density of tree species in Bale eco-region was obtained from secondary sources, mainly national research report as described in supplementary material 32.
Description of measurement methods and procedures to be applied:	Data on basic wood density of major tree species in Bale eco-region was obtained, and averaged to develop an average basic wood density to be used in the allometric equation. Although the average wood density value obtained was 0.669 (ca. 0.67 g/cm ³), we applied a conservative value of 0.6 gm/cm ³ in the allometric equation. see supplementary material 32

Frequency of monitoring/recording:	
Value applied:	0.6gm/cm ³
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Density of tree species found in the Bale forest was identified from literature and their average was computed to use it for tree carbon calculation.
Any comment:	

Data Unit / Parameter:	An allometric equation for forest type j, linking above ground biomass (in kg tree ⁻¹) to diameter at breast height (DBH) and possible tree height (H)
Data unit:	None
Description:	Global allometric equation developed by Chave et al., 2005 for dry and moist tropical forest (forest type) was used to calculate AGB (kg/tree) using wood density and DBH parameters only. Height was not considered
Source of data:	Chave et al., 2005 (scientific article) See SM 03b
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Only once at project start
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Select appropriate allometric equation for the forest, measure the dendrometric parameters of all of the trees in the sample plot and estimate the CO ₂ .see SM 03b
Any comment:	

Data Unit / Parameter:	DBH
Data unit:	Centimetre
Description:	Diameter at breast height of individual trees within sample plots
Source of data:	Field direct measurement
Description of measurement methods and procedures to be applied:	Measure the diameter of trees at breast height (DBH) or 1.3 meters of all trees with DBH ≥ 2 cm using calliper and diameter tape. Detail of the measurement procedure is provided in forest carbon measurement manual (SM 03b)
Frequency of monitoring/recording:	At project start and every five years
Value applied:	
Monitoring equipment:	Diameter tap and calliper
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Diameter measured in two opposite direction per tree was averaged and taken as DBH per tree
Any comment:	

Data Unit / Parameter:	Number of sample unit to be measured in LU/LC
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	class cl that is allocated proportional to the size of the class. If estimated $ncl < 3$, set $ncl = 3$
Data unit:	No
Description:	The total number of sampling units taken from the forest to estimate CO ₂ per hectare of the forest. The decision on the number of plots depends on vegetation type, logistics, accuracy level, manpower and cost. The number of samples for each stratum is selected proportional to its size. See SM 03b
Source of data:	Supplementary material 03b
Description of measurement methods and procedures to be applied:	The total number of plots to be measured was determined using a tool developed by Winrock International for generating number of plots (http://www.winrock.org/Ecosystems/tools.asp).
Frequency of monitoring/recording:	
Value applied:	17 sample plot from dry forest 62 plots from moist forest
Monitoring equipment:	Conduct forest inventory, GPS, GIS
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	See supplementary material 03b http://www.winrock.org/Ecosystems/tools.asp .
Any comment:	

Data Unit / Parameter:	Total area of projected baseline deforestation during the fixed baseline period of Bale REDD+ project
Data unit:	Hectares
Description:	The annual area of forest area expected to be converted into other non-forest land uses within the 20 years project period (from 2012-2031) in project area (PA), Leakage Belt (LK) and Reference Region (RR)
Source of data:	Projection based on average historical deforestation based on the analysis of land sat image of 2000, 2005, 2009 and 2011 as described in the Methodological LUC Annex (SM.04)
Description of measurement methods and procedures to be applied:	Historic deforestation (2000-2011) was assessed using the steps described in the Methodological framework presented in the LUC Annex for the PDD (and Forest Cover Benchmark Map (2011) to obtain average deforestation rate. The established average deforestation rate for each stratum was then applied to the base map to estimate future deforestation for the years 2012-2031.
Frequency of monitoring/recording:	Each renewal of fixed baseline period
Value applied	A total 289082.8 ha of forest predicted to be deforested within 20 years
Monitoring equipment:	ARCGIS, Medium resolution LND SAT image
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	See Methodological LUC Annex for Imagery, Soft wares and methods used. The validation of deforestation will be complemented by observation,

	verification and in situ monitoring
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the above-ground biomass carbon pool of initial forest class icl (Moist forest stratum)
Data unit:	tons C/ha
Description:	tone of carbon stock per hectare in above ground biomass
Source of data:	Original forest inventory was conducted and data collected by OFWE, Farm Africa, SOS Sahel Ethiopia and NCRC
Description of measurement methods and procedures to be applied:	Stratified sampling technique was applied, in which moist forest formed one of the strata. Nested 1 ha size plot was used and a total of 62 sample plots inventoried. Dendrometric parameter, principally DBH (cm), of trees falling in the sample plots were measured. Biomass per tree was estimated using Chaves et al., 2005 allometric equation (for moist tropical forest in this case), summed to per plot and hectare basis. Then, plot biomass was averaged to a per hectare biomass by strata. For estimating carbon stock, the carbon fraction of 50% based on IPCC good practice guide was applied.
Frequency of monitoring/recording:	Every five years
Value applied:	Average above ground biomass 176.54 tC/ha
Monitoring equipment:	Conducting forest inventory
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual. Or supplementary material 03b
Calculation method:	Individual tree biomass was calculated using Chave et al., 2005 allometric equation, for moist tropical forest. For wood density average value for species in the eco-region was applied (SM 32). Individual tree biomass is summed up to plot biomass. Then, plot biomass measurements were averaged to stand biomass per hectare.
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the above-ground biomass carbon pool of initial forest class icl (Dry forest stratum)
Data unit:	tons C/ha
Description:	tone of carbon stock per hectare in above ground biomass
Source of data:	Original forest inventory was conducted and data collected by OFWE, Farm Africa, SOS Sahel Ethiopia and NCRC
Description of measurement methods and procedures to be applied:	Stratified sampling technique was applied, in which dry forest stratum was one. A nested 1 ha plot size was used for the inventory. A total of 17 plots were inventoried. Dendrometric parameter, principally DBH(cm), of all trees falling within the plots were measured. Biomass per tree was estimated using Chaves et al., 2005 allometric equation (for dry tropical forest), summed to per plot and hectare

	basis. Then, plot biomass was averaged to a per hectare biomass. For estimating carbon stock, the carbon fraction of 50% based on IPCC good practice guide was applied.
Frequency of monitoring/recording:	Every five years
Value applied:	Average above ground biomass 99.71 t C/ha
Monitoring equipment:	Conducting forest inventory
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual. Or supplementary material 03b
Calculation method:	Individual tree biomass was calculated using Chave et al., 2005 allometric equation for dry tropical forest. For wood density average value for species in the eco-region was applied (SM 32). Individual tree biomass is summed up to plot biomass. Then, plot biomass measurements were averaged to stand biomass per hectare.
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the below - ground biomass carbon pool of initial forest class icl (Dry and moist strata)
Data unit:	Tons C/ha
Description:	Tone of carbon stock per hectare in above ground biomass
Source of data:	Forest inventory conducted NCRC, OFWE, Farm Africa and SOS Sahel Ethiopia
Description of measurement methods and procedures to be applied:	Below ground biomass and carbon stock were derived from Above ground biomass and carbon stock, were measured as described above. The Below ground biomass and carbon were calculated applying the IPCC good practice guide: which indicates root: shoot of 24% for moist forest and 27% for dry forest.
Frequency of monitoring/recording:	Every five years
Value applied:	For moist forest 42.37 t/ha, and for Dry forest 26.92 t/ha.
Monitoring equipment:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	After calculating the above ground biomass, it is assumed that below ground biomass of a tree consisted 27% and 24% of the total above ground biomass for the dry and moist forests, respectively.
Any comment:	

Data Unit / Parameter:	Cumulative actual carbon stock change due to un avoided unplanned deforestation at year t in the project area
Data unit:	tCO ₂ -e
Description:	Total amount of CO ₂ e GHG emitted from the project during the project life time
Source of data:	Predicted deforestation (activity data) multiplied by the emission factor obtained from forest inventory

Description of measurement methods and procedures to be applied:	The average carbon stock per hectare by forest stratum (emission factor in CO ₂ e) was obtained from forest inventory and was multiplied by predicted deforestation by forest strata and cumulated over the project life time to provide ex-ante cumulative carbon stock change from unavioded unplanned deforestation.
Frequency of monitoring/recording:	Annually
Value applied:	627245.54 tCO ₂ -e (average of 20 years)
Monitoring equipment:	Conducting forest inventory, remote sensing GIS and land sat
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:0	Multiple emission factor by activity data per year, and cumulate the result over the project period, and divide the total by the project life time (yr)
Any comment:	

Data Unit / Parameter:	Total actual carbon stock change due to unavioded unplanned deforestation at year <i>t</i> in the project area
Data unit:	tCO ₂ -e
Description:	Total CO ₂ -e emitted during the project life time
Source of data:	Emission factor (obtained from forest inventory) & activity data per year and per forest stratum as obtained from projected deforestation
Description of measurement methods and procedures to be applied:	The emission factor established for each forest stratum based on forest inventory was multiplied by the activity data per year and forest stratum and the resulting value summed up to the project life time.
Frequency of monitoring/recording:	Annually
Value applied:	12544910.88
Monitoring equipment:	Conduct forest inventory, remote sensing image analysis
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Multiplication of emission factor by forest stratum with projected annual activity data per stratum, then adding the annual value to the total project life time.
Any comment:	

Data Unit / Parameter:	Cumulative net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity
Data unit:	tCO ₂ -e
Description:	The total amount of anthropogenic gas emission reduced due to project intervention for the given period of time.
Source of data:	Forest inventory for emission factor, and projected deforestation and project claimed performance factor
Description of measurement methods and procedures to be applied:	The emission factor was multiplied by activity data and the result was reduced by the factor of performance factor to estimate net emission reduction due to the project.
Frequency of monitoring/recording:	Annually

Value applied:	25776421.4 (cumulative over the project period)
Monitoring equipment:	Conduct forest inventory, remote sensing image analysis
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Emission factor is multiplied by activity data and the resulting product was multiplied by the performance factor claimed by the project
Any comment:	

Data Unit / Parameter:	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Data unit:	tCO ₂ -e
Description:	Mean anthropogenic gas emission reduced due to project intervention per year (average of 20 years).
Source of data:	Emission factor from forest inventory, projected activity data from historic deforestation and performance factor by the project
Description of measurement methods and procedures to be applied:	Emission factor was established for the different forest stratum based on forest inventory, this was multiplied by activity data projected based on historic deforestation and finally the product of the two multiplied by the project claimed performance factor.
Frequency of monitoring/recording:	Annually
Value applied:	1288821.07 (average of 20 years)
Monitoring equipment:	Forest inventory, and remote sensing image analysis
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Emission factor multiplied by activity data multiplied by the performance factor per year.
Any comment:	

Data Unit / Parameter:	Risk factor used to calculate VCS buffer credits
Data unit:	%
Description:	This refers to risk elements that may affect forest carbon stock and is used to estimate buffer credits based on VCS non-permanence risk tool.
Source of data:	Project social, political, economic and environmental situation assessment or analysis (elements required in the VCS non-permanence risk tool)
Description of measurement methods and procedures to be applied:	Risk factors derived based on the guideline in the VCS-approved AFOLU Non-Permanence Tool
Frequency of monitoring/recording:	Each renewal of fixed baseline period
Value applied:	15%
Monitoring equipment:	VCS-approved AFOLU Non-Permanence Tool
QA/QC procedures to be applied:	
Calculation method:	Select the likely risks that assumed to appear in the

	eco-region from the list of VCS-approved Non-Permanence tool and give the score then add the total.
Any comment:	

Data Unit / Parameter:	Root-shoot ratio appropriate for species, group of species or forest type
Data unit:	%
Description:	The ratio of the amount of belowground biomass (root) divided by above ground tree biomass.
Source of data:	IPCC good practice guide
Description of measurement methods and procedures to be applied:	The root-shoot ratio for calculating below ground biomass of the forest strata was obtained from IPCC good practice guide. Different value was used for the different stratum available in the project forest
Frequency of monitoring/recording:	Only once at project start
Value applied:	24% for moist forest and 27% for dry forest
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Start date of the historical reference period
Data unit:	Year
Description:	The year 2000 is the start year of historical reference period which is 2000-2011
Source of data:	See SM 04 (10-15 years before project start date was used as a reference to determine the historic reference period, based on IPCC guide
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Once at the project start
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Duration of the historical reference period
Data unit:	Yrs
Description:	2000-2011 (12 years)
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Only once at project start
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Number of Buffer credits deposited in the VCS Buffer at time t
Data unit:	tCO ₂ e
Description:	The amount of tCO ₂ e GHG set aside as buffer to make up the risk identified for the project
Source of data:	Risk assessment for the project
Description of measurement methods and procedures to be applied:	The net emission reduction calculated for the project was multiplied by the buffer risk (15%) to obtain buffer credit by each year. The annual value is cumulated to total project life time buffer credit.
Frequency of monitoring/recording:	Annually
Value applied:	193323.16 tCO ₂ e (average of 20 years)
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	The Buffer for risk carbon unit was calculated by multiplying net emission reduction per year by the risk factor estimated for the project , which is 15%
Any comment:	

Data Unit / Parameter:	Number of Verified Carbon Units(VCUs) to be made available for trade at time t
Data unit:	tCO ₂ e
Description:	The net tCO ₂ e GHG available after reduction of buffer for risk
Source of data:	Carbon assessment
Description of measurement methods and procedures to be applied:	The net VCU available for trade is obtained after reducing the buffer for risk value from the ex-ante net emission reduction by the project
Frequency of monitoring/recording:	Annually
Value applied:	1095497.91
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	The verified Carbon Units (VCTs) are calculated by subtracting the number of Buffer Credits (BCt) deposited in the VCS Buffer at time t, from the <i>Ex ante</i> estimated net anthropogenic greenhouse gas emission reduction by the project
Any comment:	

8.3 Data and Parameters Monitored (CL4, CM4,& B4)

Data Unit / Parameter:	Area of dry ever green and moist forest deforested in 20 years within the leakage belt in the baseline case
Data unit:	Hectares/year
Description:	The annual area leakage belt forest converted to non- forest land use
Source of data:	Analysis of landsat image of 2000,2005,2009 and 2011 available in GIS data files in Methodological LUC Annex
Description of measurement methods and procedures to be applied:	Deforestation will be measured using the same steps of the Methodological steps used and presented in the LUC Annex for the PDD. Based on

	the historical land-use and land-cover change analysis (detailed in the Methodological Annex) a historical rate for each forest strata were estimated, using an historical reference period of 2000-2011 (see VM0015, v1.1, Table 8).
Frequency of monitoring/recording:	3 years
Value applied:	571.8ha/year of dry evergreen forest and 1011.8 ha/year of moist forest
Monitoring equipment:	ARCGIS, Medium resolution LND SAT image
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	See Methodological LUC Annex for Imagery, Softwares and methods used. The validation of deforestation will be complemented by observation, verification and in situ monitoring
Any comment:	

Data Unit / Parameter:	Area dry evergreen and moist forest deforested in 20 years within the project area in the baseline case
Data unit:	Hectares/year
Description:	The annual area of dry ever green and moist forest converted to non forest land use
Source of data:	Analysis of land sat image of 2000,2005,2009 and 2011 available in GIS data files in Methodological LUC Annex
Description of measurement methods and procedures to be applied:	Deforestation will be measured using the same steps of the Methodological steps used and presented in the LUC Annex for the PDD.
Frequency of monitoring/recording:	3 years
Value applied:	Average 726.48/year ha of dry evergreen and average 3481.02ha/year of moist forest
Monitoring equipment:	ARCGIS, Medium resolution LND SAT image
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	See Methodological LUC Annex for Imagery, Software and methods used. The validation of deforestation will be complemented by observation, verification and in situ monitoring
Any comment:	

Data Unit / Parameter:	Area of dry evergreen and moist forest deforested in 20 years within the reference region in the baseline case
Data unit:	Hectares /year
Description:	The annual area leakage belt forest converted to non- forest land use
Source of data:	Analysis of landsat image of 2000,2005,2009 and 2011 available in GIS data files in Methodological LUC Annex
Description of measurement methods and procedures to be applied:	Deforestation will be measured using the same steps of the Methodological steps used and presented in the LUC Annex for the PDD.
Frequency of monitoring/recording:	3 years
Value applied:	6471.8ha/year of dry evergreen and 4559.3ha/year

	moist forest
Monitoring equipment:	ARCGIS, Medium resolution LND SAT image
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	See Methodological LUC Annex for Imagery, Softwares and methods used. The validation of deforestation will be complemented by observation, verification and in situ monitoring
Any comment:	

Data Unit / Parameter:	Plot area
Data unit:	Meter square (m ²)
Description:	This is a sample of forest from which forest biomass data was collected. A size of 10,000 m ² or equivalent to 1 ha size was applied.
Source of data:	The size and shape applied was based on Pearson et al, (2005) as recommended also by VM0015 v1.1.
Description of measurement methods and procedures to be applied:	The plot area has major influence on the sampling intensity, time and resources spent in the field measurements. The area of a plot depends on the stand density , accordingly 17 sample plots from dry evergreen and 62 sample plots were from moist forest were taken.
Frequency of monitoring/recording:	None
Value applied:	1ha (10,000m ²)
Monitoring equipment:	Measuring tape
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	The design of the sampling framework and execution of the field measurements followed the guidance of appendix 3 of the VM0015 v 1.1 and chapter 4.3 of GPG LULUCF, (2003) as well as the sourcebook for LULUCF (Pearson et al, 2005).
Any comment:	

Data Unit / Parameter:	Total forest area in dry evergreen forest within the reference region at the project start date
Data unit:	Hectares
Description:	The dry evergreen montane forest is a complex vegetation type occurring within an altitudinal range of 1500-2700 m, with average annual temperature and rainfall of 14-25° C and 700-1100 mm, respectively Lowland and highland dry forest are included in one class. These are located on the north side of the Bale Mountain.
Source of data:	Analysis of land sat images and SPOT imagery (2011) interpretation (2.2. VM0015, v1.1)
Description of measurement methods and procedures to be applied:	The afro-alpine grassland and Erica shrub land covers were defined primarily by elevation, being above ~3,400 meters, and visual interpretation from SPOT imagery (2011). Both strata of forest were primarily located above 1,500 m of elevation and were identified by their canopy characteristics and location on the northern (e.g. dry) and southern (e.g. moist) flanks of the Bale Mountain.

	Precipitation, derived from the Tropical Rainfall Monitoring Mission (TRMM) was a factor included in classifying images
Frequency of monitoring/recording:	3 years
Value applied:	22853 ha
Monitoring equipment:	ARCGIS, Medium resolution LND SAT image
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	See Methodological LUC Annex for Imagery, Soft wares and methods used. The validation of deforestation will be complemented by observation, verification and in situ monitoring
Any comment:	

Data Unit / Parameter:	Total forest area in moist forest within the reference region at the project start date
Data unit:	Hectares
Description:	Mainly highland forest above 1,500 m elevation and located exclusively on the south face of Bale Mountain.
Source of data:	Analysis of land sat images and SPOT imagery (2011) interpretation (2.2. VM0015, v1.1)
Description of measurement methods and procedures to be applied:	The afro-alpine grassland and Erica shrub land covers were defined primarily by elevation, being above ~3,400 meters, and visual interpretation from SPOT imagery (2011). Both strata of forest were primarily located above 1,500 m of elevation and were identified by their canopy characteristics and location on the northern (e.g. dry) and southern (e.g. moist) flanks of the Bale Mountain. Precipitation, derived from the Tropical Rainfall Monitoring Mission (TRMM) was a factor included in classifying images
Frequency of monitoring/recording:	3 years
Value applied:	238200 ha
Monitoring equipment:	ARCGIS, Medium resolution LND SAT image
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	See Methodological LUC Annex for Imagery, Softwares and methods used. The validation of deforestation will be complemented by observation, verification and in situ monitoring
Any comment:	

Data Unit / Parameter:	Total area of projected baseline deforestation during the fixed baseline period of Bale REDD+ project
Data unit:	Hectares
Description:	The annual area of forest area expected to be converted into other non-forest land uses within the 20 years project period (from 2012-2031) in project area (PA), Leakage Belt (LK) and Reference Region (RR)
Source of data:	Projection based on average historical deforestation based on the analysis of land sat image of 2000, 2005, 2009 and 2011 as described

	in the Methodological LUC Annex (SM.04)
Description of measurement methods and procedures to be applied:	Historic deforestation (2000-2011) was assessed using the steps described in the Methodological framework presented in the LUC Annex for the PDD (and Forest Cover Benchmark Map (2011) to obtain average deforestation rate. The established average deforestation rate for each stratum was then applied to the base map to estimate future deforestation for the years 2012-2031.
Frequency of monitoring/recording:	Each renewal of fixed baseline period
Value applied	A total 289082.8 ha of forest predicted to be deforested within 20 years
Monitoring equipment:	ARCGIS, Medium resolution LND SAT image
QA/QC procedures to be applied:	See QA / QC protocols document in Annex 21 of Bale forest carbon stocks assessment manual
Calculation method:	See Methodological LUC Annex for Imagery, Soft wares and methods used. The validation of deforestation will be complemented by observation, verification and in situ monitoring
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the above-ground biomass carbon pool of initial forest class icl (Moist forest stratum)
Data unit:	tons C/ha
Description:	tone of carbon stock per hectare in above ground biomass
Source of data:	Original forest inventory was conducted and data collected by OFWE, Farm Africa, SOS Sahel Ethiopia and NCRC
Description of measurement methods and procedures to be applied:	Stratified sampling technique was applied, in which moist forest formed one of the strata. Nested 1 ha size plot was used and a total of 62 sample plots inventoried. Dendrometric parameter, principally DBH (cm), of trees falling in the sample plots were measured. Biomass per tree was estimated using Chaves et al., 2005 allometric equation (for moist tropical forest in this case), summed to per plot and hectare basis. Then, plot biomass was averaged to a per hectare biomass by strata. For estimating carbon stock, the carbon fraction of 50% based on IPCC good practice guide was applied.
Frequency of monitoring/recording:	Every five years
Value applied:	Average above ground biomass 176.54 tC/ha
Monitoring equipment:	Conducting forest inventory
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual. Or supplementary material 03b
Calculation method:	Individual tree biomass was calculated using Chave et al., 2005 allometric equation, for moist tropical forest. For wood density average value for species in the eco-region was applied (SM 32). Individual tree biomass is summed up to plot biomass. Then, plot biomass measurements were averaged to stand biomass per hectare.
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the above-ground biomass carbon pool of initial forest class icl (Dry forest stratum)
Data unit:	tons C/ha
Description:	tone of carbon stock per hectare in above ground biomass
Source of data:	Original forest inventory was conducted and data collected by OFWE, Farm Africa, SOS Sahel Ethiopia and NCRC
Description of measurement methods and procedures to be applied:	Stratified sampling technique was applied, in which dry forest stratum was one. A nested 1 ha plot size was used for the inventory. A total of 17 plots were inventoried. Dendrometric parameter, principally DBH(cm), of all trees falling within the plots were measured. Biomass per tree was estimated using Chaves et al., 2005 allometric equation (for dry tropical forest), summed to per plot and hectare basis. Then, plot biomass was averaged to a per hectare biomass. For estimating carbon stock, the carbon fraction of 50% based on IPCC good practice guide was applied.
Frequency of monitoring/recording:	Every five years
Value applied:	Average above ground biomass 99.71 t C/ha
Monitoring equipment:	Conducting forest inventory
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual. Or supplementary material 03b
Calculation method:	Individual tree biomass was calculated using Chave et al., 2005 allometric equation for dry tropical forest. For wood density average value for species in the eco-region was applied (SM 32). Individual tree biomass is summed up to plot biomass. Then, plot biomass measurements were averaged to stand biomass per hectare.
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the below -ground biomass carbon pool of initial forest class icl (Dry and moist strata)
Data unit:	Tons C/ha
Description:	Tone of carbon stock per hectare in above ground biomass
Source of data:	Forest inventory conducted NCRC, OFWE, Farm Africa and SOS Sahel Ethiopia
Description of measurement methods and procedures to be applied:	Below ground biomass and carbon stock were derived from Above ground biomass and carbon stock, were measured as described above. The Below ground biomass and carbon were calculated applying the IPCC good practice guide: which indicates root: shoot of 24% for moist forest and 27% for dry forest.
Frequency of monitoring/recording:	Every five years
Value applied:	For moist forest 42.37 t/ha, and for Dry forest 26.92 t/ha.
Monitoring equipment:	See QA QC protocols in Annex6 of Bale forest

	carbon assessment manual
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	After calculating the above ground biomass, it is assumed that below ground biomass of a tree consisted 27% and 24% of the total above ground biomass for the dry and moist forests, respectively.
Any comment:	

Data Unit / Parameter:	Total baseline carbon stock changes for the above-ground biomass pool in the project area
Data unit:	
Description:	.
Source of data:	
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Total baseline carbon stock changes for the above-ground biomass pool in the project area
Data unit:	
Description:	.
Source of data:	
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Cumulative actual carbon stock change due to un avoided unplanned deforestation at year <i>t</i> in the project area
Data unit:	tCO ₂ -e
Description:	Total amount of CO ₂ e GHG emitted from the project during the project life time
Source of data:	Predicted deforestation (activity data) multiplied by the emission factor obtained from forest inventory
Description of measurement methods and procedures to be applied:	The average carbon stock per hectare by forest stratum (emission factor in CO ₂ e) was obtained from forest inventory and was multiplied by predicted deforestation by forest strata and cumulated over the project life time to provide ex-ante cumulative carbon stock change from un avoided unplanned deforestation.

Frequency of monitoring/recording:	Annually
Value applied:	627245.54 tCO ₂ -e (average of 20 years)
Monitoring equipment:	Conducting forest inventory, remote sensing GIS and land sat
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:0	Multiple emission factor by activity data per year, and cumulate the result over the project period, and divide the total by the project life time (yr)
Any comment:	

Data Unit / Parameter:	Total actual carbon stock change due to unavioded unplanned deforestation at year <i>t</i> in the project area
Data unit:	tCO ₂ -e
Description:	Total CO ₂ -e emitted during the project life time
Source of data:	Emission factor (obtained from forest inventory) & activity data per year and per forest stratum as obtained from projected deforestation
Description of measurement methods and procedures to be applied:	The emission factor established for each forest stratum based on forest inventory was multiplied by the activity data per year and forest stratum and the resulting value summed up to the project life time.
Frequency of monitoring/recording:	Annually
Value applied:	12544910.88
Monitoring equipment:	Conduct forest inventory, remote sensing image analysis
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Multiplication of emission factor by forest stratum with projected annual activity data per stratum, then adding the annual value to the total project life time.
Any comment:	

Data Unit / Parameter:	Cumulative net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity
Data unit:	tCO ₂ -e
Description:	The total amount of anthropogenic gas emission reduced due to project intervention for the given period of time.
Source of data:	Forest inventory for emission factor, and projected deforestation and project claimed performance factor
Description of measurement methods and procedures to be applied:	The emission factor was multiplied by activity data and the result was reduced by the factor of performance factor to estimate net emission reduction due to the project.
Frequency of monitoring/recording:	Annually
Value applied:	25776421.4 (cumulative over the project period)
Monitoring equipment:	Conduct forest inventory, remote sensing image analysis
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Emission factor is multiplied by activity data and the resulting product was multiplied by the performance

	factor claimed by the project
Any comment:	

Data Unit / Parameter:	Net anthropogenic greenhouse gas emission reduction attributable to the AUD project activity at year t
Data unit:	tCO ₂ -e
Description:	Mean anthropogenic gas emission reduced due to project intervention per year (average of 20 years).
Source of data:	Emission factor from forest inventory, projected activity data from historic deforestation and performance factor by the project
Description of measurement methods and procedures to be applied:	Emission factor was established for the different forest stratum based on forest inventory, this was multiplied by activity data projected based on historic deforestation and finally the product of the two multiplied by the project claimed performance factor.
Frequency of monitoring/recording:	Annually
Value applied:	1288821.07 (average of 20 years)
Monitoring equipment:	Forest inventory, and remote sensing image analysis
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Emission factor multiplied by activity data multiplied by the performance factor per year.
Any comment:	

Data Unit / Parameter:	Mean Wood density of species
Data unit:	Gram/cubic centimetre (g/cm ³)
Description:	Average basic wood density for major species in Bale eco-region
Source of data:	Data on basic wood density of tree species in Bale eco-region was obtained from secondary sources, mainly national research report as described in supplementary material 32.
Description of measurement methods and procedures to be applied:	Data on basic wood density of major tree species in Bale eco-region was obtained, and averaged to develop an average basic wood density to be used in the allometric equation. Although the average wood density value obtained was 0.669 (ca. 0.67 g/cm ³), we applied a conservative value of 0.6 gm/cm ³ in the allometric equation. see supplementary material 32
Frequency of monitoring/recording:	
Value applied:	0.6gm/cm ³
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Density of tree species found in the Bale forest was identified from literature and their average was computed to use it for tree carbon calculation.
Any comment:	

Data Unit / Parameter:	Ex ante estimated effectiveness index
Data unit:	%

Description:	The effectiveness of project activities in addressing deforestation.
Source of data:	Project self assessment
Description of measurement methods and procedures to be applied:	Project proponent assessed its project implementation potential based on performance history
Frequency of monitoring/recording:	Annually
Value applied:	The project assumes an effectiveness index of 50% during the initial years of implementation and will increase gradually to 80%. The average is 68.75%
Monitoring equipment:	Not applicable
QA/QC procedures to be applied:	Not applicable
Calculation method:	Not applicable
Any comment:	

Data Unit / Parameter:	Sum of ex-ante estimated leakage emission at year t
Data unit:	tCO ₂ -e
Description:	Ex-ante estimation of CO ₂ e emission from deforestation in the leakage belt
Source of data:	Forest inventory to establish emission factor and projected deforestation based on historic deforestation analysis for activity data in the leakage belt
Description of measurement methods and procedures to be applied:	Forest inventory was conducted to establish emission factor, while historic deforestation rate was analyzed to establish activity data for the leakage belt as in the project area.
Frequency of monitoring/recording:	Annually
Value applied:	13718648
Monitoring equipment:	forest inventory and remote sensing
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Emission factor multiplied with projected area of deforestation (activity data) in the leakage belt
Any comment:	

Data Unit / Parameter:	An allometric equation for species, or forest type j, linking above ground biomass (in kg tree ⁻¹) to diameter at breast height (DBH) and possible tree height (H)
Data unit:	None
Description:	Global allometric equation developed by Chave et al., 2005 for dry and moist tropical forest (forest type) was used to calculate AGB (kg/tree) using wood density and DBH parameters only. Height was not considered
Source of data:	Chave et al., 2005 (scientific article) See SM 03b
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Only once at project start
Value applied:	
Monitoring equipment:	

QA/QC procedures to be applied:	
Calculation method:	Select appropriate allometric equation for the forest, measure the dendrometric parameters of all of the trees in the sample plot and estimate the CO ₂ .see SM 03b
Any comment:	

Data Unit / Parameter:	Total number of sample units to be measured (in all LU/LC classes)
Data unit:	No
Description:	Total number of sample plots used for forest inventory in all forest stratum (dry and moist)
Source of data:	Field inventory
Description of measurement methods and procedures to be applied:	The decision on the number of plots depends on vegetation type, logistics, accuracy level, manpower and cost. The number of samples for each stratum is selected proportional to its size. See SM 03b
Frequency of monitoring/recording:	
Value applied:	78 plots
Monitoring equipment:	
QA/QC procedures to be applied:	See
Calculation method:	The total number of plots to be measured was determined using a tool developed by Winrock International for generating number of plots (http://www.winrock.org/Ecosystems/tools.asp).
Any comment:	

Data Unit / Parameter:	Number of sample unit to be measured in LU/LC class cl that is allocated proportional to the size of the class. If estimated $ncl < 3$, set $ncl = 3$
Data unit:	No
Description:	The total number of sampling units taken from the forest to estimate CO ₂ per hectare of the forest. The decision on the number of plots depends on vegetation type, logistics, accuracy level, manpower and cost. The number of samples for each stratum is selected proportional to its size. See SM 03b
Source of data:	Supplementary material 03b
Description of measurement methods and procedures to be applied:	The total number of plots to be measured was determined using a tool developed by Winrock International for generating number of plots (http://www.winrock.org/Ecosystems/tools.asp).
Frequency of monitoring/recording:	
Value applied:	17 sample plot from dry forest 62 plots from moist forest
Monitoring equipment:	Conduct forest inventory, GPS, GIS
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	See supplementary material 03b http://www.winrock.org/Ecosystems/tools.asp .
Any comment:	

Data Unit / Parameter:	Risk factor used to calculate VCS buffer credits
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Data unit:	%
Description:	This refers to risk elements that may affect forest carbon stock and is used to estimate buffer credits based on VCS non-permanence risk tool.
Source of data:	Project social, political, economic and environmental situation assessment or analysis (elements required in the VCS non-permanence risk tool)
Description of measurement methods and procedures to be applied:	Risk factors derived based on the guideline in the VCS-approved AFOLU Non-Permanence Tool
Frequency of monitoring/recording:	Each renewal of fixed baseline period
Value applied:	15%
Monitoring equipment:	VCS-approved AFOLU Non-Permanence Tool
QA/QC procedures to be applied:	
Calculation method:	Select the likely risks that assumed to appear in the eco-region from the list of VCS-approved Non-Permanence tool and give the score then add the total.
Any comment:	

Data Unit / Parameter:	Root-shoot ratio appropriate for species, group of species or forest type
Data unit:	%
Description:	The ratio of the amount of belowground biomass (root) divided by above ground tree biomass.
Source of data:	IPCC good practice guide
Description of measurement methods and procedures to be applied:	The root-shoot ratio for calculating below ground biomass of the forest strata was obtained from IPCC good practice guide. Different value was used for the different stratum available in the project forest
Frequency of monitoring/recording:	Only once at project start
Value applied:	24% for moist forest and 27% for dry forest
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Start date of the historical reference period
Data unit:	Year
Description:	The year 2000 is the start year of historical reference period which is 2000-2011
Source of data:	See SM 04 (10-15 years before project start date was used as a reference to determine the historic reference period, based on IPCC guide
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Once at the project start
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	

Calculation method:	
Any comment:	

Data Unit / Parameter:	Duration of the historical reference period
Data unit:	Yrs
Description:	2000-2011 (12 years)
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	Only once at project start
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	t-student value for 95% confidence level
Data unit:	Unit less
Description:	Student t- value was obtained from t-table to calculate CI
Source of data:	t-table
Description of measurement methods and procedures to be applied:	Student t-table value was obtained by taking the degree of freedom (n-1) for the sample number used in each forest stratum
Frequency of monitoring/recording:	
Value applied:	2.00 for moist forest and 2.11 for dry forest strata
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Variable included in the deforestation model
Data unit:	
Description:	Variables that were identified to drive and/or hinder deforestation were identified through field assessment and expert consultation, and applied for modelling future location of deforestation
Source of data:	See SM 04
Description of measurement methods and procedures to be applied:	About eight variables were employed for modelling of deforestation in Bale mountains eco-region. These variables were entered to dinamica software to run modelling.
Frequency of monitoring/recording:	Each renewal of fixed baseline period
Value applied:	Eight (settlement, roads, protected area, natural coffee area, distance to deforestation, elevation ,slope, population growth)
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Using Dynamica software
Any comment:	

Data Unit / Parameter:	Number of Buffer credits deposited in the VCS Buffer at time t
Data unit:	tCO ₂ e
Description:	The amount of tCO ₂ e GHG set aside as buffer to make up the risk identified for the project
Source of data:	Risk assessment for the project
Description of measurement methods and procedures to be applied:	The net emission reduction calculated for the project was multiplied by the buffer risk (15%) to obtain buffer credit by each year. The annual value is cumulated to total project life time buffer credit.
Frequency of monitoring/recording:	Annually
Value applied:	193323.16 tCO ₂ e (average of 20 years)
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	The Buffer for risk carbon unit was calculated by multiplying net emission reduction per year by the risk factor estimated for the project , which is 15%
Any comment:	

Data Unit / Parameter:	Number of Verified Carbon Units(VCUs) to be made available for trade at time t
Data unit:	tCO ₂ e
Description:	The net tCO ₂ e GHG available after reduction of buffer for risk
Source of data:	Carbon assessment
Description of measurement methods and procedures to be applied:	The net VCU available for trade is obtained after reducing the buffer for risk value from the ex-ante net emission reduction by the project
Frequency of monitoring/recording:	Annually
Value applied:	1095497.91
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	The verified Carbon Units (VCTs) are calculated by subtracting the number of Buffer Credits (BCt) deposited in the VCS Buffer at time t, from the <i>Ex ante</i> estimated net anthropogenic greenhouse gas emission reduction by the project
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the dead wood biomass carbon pool of final post-deforestation class fcl
Data unit:	
Description:	.
Source of data:	
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

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Data Unit / Parameter:	Average carbon stock per hectare in the dead wood biomass carbon pool of LU/LC class cl
Data unit:	
Description:	.
Source of data:	
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the dead wood biomass carbon pool initial forest class icl
Data unit:	
Description:	.
Source of data:	
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Average carbon stock per hectare in the dead wood biomass carbon pool per zone z
Data unit:	
Description:	.
Source of data:	
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Average combustion efficiency of the carbon pool p in the forest class
Data unit:	
Description:	.
Source of data:	

Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Carbon fraction for tree tr, of species, group of species or forest type j
Data unit:	%
Description:	IPCC good practice guide for carbon fraction, which is 50% of oven dry weight of a tree was used
Source of data:	IPCC good practice guide
Description of measurement methods and procedures to be applied:	IPCC good practice guide was applied
Frequency of monitoring/recording:	Once in the project lifetime
Value applied:	0.5, i.e. 50% of oven dry weight
Monitoring equipment:	None
QA/QC procedures to be applied:	None
Calculation method:	Total above ground biomass per hectare of all sample plots were estimated and their average dry weight computed using allometric equation. This value was multiplied by 0.5 to obtain carbon stock
Any comment:	

Data Unit / Parameter:	DBH
Data unit:	Centimetre
Description:	Diameter at breast height of individual trees within sample plots
Source of data:	Field direct measurement
Description of measurement methods and procedures to be applied:	Measure the diameter of trees at breast height (DBH) or 1.3 meters of all trees with DBH ≥ 2 cm using calliper and diameter tape. Detail of the measurement procedure is provided in forest carbon measurement manual (SM 03b)
Frequency of monitoring/recording:	At project start and every five years
Value applied:	
Monitoring equipment:	Diameter tap and calliper
QA/QC procedures to be applied:	See QA QC protocols in Annex6 of Bale forest carbon assessment manual
Calculation method:	Diameter measured in two opposite direction per tree was averaged and taken as DBH per tree
Any comment:	

Data Unit / Parameter:	Height of the tree
Data unit:	
Description:	.
Source of data:	
Description of measurement methods and procedures to be applied:	Not applicable
Frequency of monitoring/recording:	

Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

Data Unit / Parameter:	Community forest income change
Data unit:	US\$/hh/yr
Description:	Household economic data collection using randomly selected sample households and compare with baseline income level
Source of data:	Field data collection
Description of measurement methods and procedures to be applied:	Household based socio economic survey
Frequency of monitoring/recording:	Every year
Value applied:	US \$ 842.00 is the baseline income from forest based income
Monitoring equipment:	Survey
QA/QC procedures to be applied:	Sufficient number of sample households will be used in the assessment
Calculation method:	Household income disaggregated by source: agriculture, forestry and others
Any comment:	

Data Unit / Parameter:	Community forest management institution capacity assessment
Data unit:	%
Description:	Capacity is assessed regularly using a method developed by the project called Organizational Capacity Assessment Tool (OCAT). The assessment comprises the following parameters: forest protection, forest development, forest utilization ,cooperative financial management and leadership. The tool applies scale based assessment and overall average indicates status of the CBO. Based on the result, capacity gap will be known and needed capacity will be built.
Source of data:	Assessment of capacity of Forest management cooperatives
Description of measurement methods and procedures to be applied:	Using established survey questions included in the OCAT tool, all necessary data were assessed from each forest managing institution and analysed using the developed Organizational Capacity Assessment Tool (OCAT) software
Frequency of monitoring/recording:	Annually
Value applied:	48.8%, baseline
Monitoring equipment:	Annual re-assessment
QA/QC procedures to be applied:	
Calculation method:	A total of 50 questions, each question has a value of 0,1,2 value as per their capacity, these values added to give the overall result from 100. The average result was
Any comment:	Depending on the assessment result capacity building strategy designed planed and delivered.

Data Unit / Parameter:	Biodiversity condition of the area
Data unit:	Species richness; stem/ha
Description:	Biodiversity potential of the forest assessed
Source of data:	Field data
Description of measurement methods and procedures to be applied:	Species abundance or richness of indicator plants and animals (those identified as threatened species such as <i>Coffea Arabica</i>) will be assessed
Frequency of monitoring/recording:	Every five years
Value applied:	
Monitoring equipment:	Survey
QA/QC procedures to be applied:	Conduct similar study by different researcher/surveyor
Calculation method:	Assessing density of species per hectare based on field assessment
Any comment:	So far there is no scientific study, however, participatory forest assessment was conducted to develop forest management plan and use as a baseline for monitoring of improvement in forest condition (attaché PFRA format)

Data Unit / Parameter:	Monitor community attitude and perception on the project
Data unit:	
Description:	Using established survey questions and participatory rural appraisal (PRA) techniques Communities' attitude toward the project assessed
Source of data:	Community living in and around the forest
Description of measurement methods and procedures to be applied:	Different PRA tools deployed to assess communities' perception and attitude and cross checked with the result of semi structured interview
Frequency of monitoring/recording:	Every five years
Value applied:	
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	

9 REFERENCES

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10. GLOSSARY

Additionality - Environmental or emissions additionality refers to carbon accounting procedures, where projects should demonstrate real, measurable and long-term results, for the reduction or prevention of carbon emissions that would not occur without the project.

Baseline - The baseline represents the expected conditions (they are related to climate, biodiversity and communities) for a "business as usual" scenario and "without project" scenario (i.e. without the implementation of project activities). Usually we use the term "baseline scenario" or "reference scenario".

Carbon pools - A reservoir of carbon. A system that has the ability to accumulate or release carbon. Carbon pools are measured in terms of mass (e.g. metric tons of carbon).

Carbon Dioxide (CO₂) - 3.666 units of CO₂ are equal to one unit of carbon (C). CO₂ plays an important role in creating and regulating Earth's climate (see Greenhouse Gases - GHG).

Carbon Dioxide Equivalent (CO₂e) - It is the universal measure used to indicate the global warming potential of each of the seven greenhouse gases. It is used to assess the impacts of emissions (or avoided emissions) of different greenhouse gases.

Carbon Sink - Any process, activity or mechanism that results in net removal of greenhouse gases from the atmosphere.

Carbon Source - The opposite of a sink. A carbon sink is a net source of carbon to the atmosphere where the flow of carbon to the atmosphere is greater than the absorption of carbon reservoir.

Carbon Stocks - The amount of carbon contained in a sink at a given time.

Climate Change Mitigation - Reducing emissions of greenhouse gases (GHG) emissions to achieve stabilization of the concentration of such gases in the atmosphere, thus preventing global warming.

Crediting period - The time period in which the project will quantify the changes in net reduction of GHG emissions or removals.

Endangered Species - The term "threatened" is used to describe an endangered species, specifically those that fit into the categories of threat defined by the IUCN as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU). The IUCN Red List of Threatened Species is currently the most comprehensive global standard on the worldwide distribution and status of threatened species.

Endemic species - species that has its global distribution restricted to a particular site, region or country.

Greenhouse Gas (GHG) - Greenhouse gases are gaseous components of the atmosphere that capture the infrared heat and contribute to the greenhouse effect the planet Earth. In addition to carbon dioxide (CO₂), the major greenhouse gases include methane (CH₄) and nitrous oxide (N₂O).

Global Warming Potential (GWP) of three greenhouse gases associated with forest activities are described below. CO₂ remains in the atmosphere for approximately 200 to 450 years and its GWP is defined as 1. Methane remains in the atmosphere for 9 to 15 years, and has a GWP of 22 (which has a mean power of global warming 22 times greater than carbon dioxide). Nitrous oxide persists in the atmosphere for about 120 years and has a GWP of 310.

GMO - "Genetically Modified Organism". GMOs are defined as any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology which is capable of transferring or replicating genetic material.

High Conservation Values - HCV - There are six attributes of high conservation value, based on the definition originally developed for FSC certification for forests, but now expanded to be applied in evaluating other ecosystems (<http://hcvnetwork.org/>).

Intergovernmental Panel on Climate Change (IPCC) - Established in 1988 as a special organ of the United Nations Environment Programme (UNEP) and World Meteorological Organization (WMO) to provide assessment reports for decision makers on the current results of climate change research. The IPCC is responsible for providing technical and scientific grounds for the United Nations Framework Convention on Climate Change (UNFCCC), primarily through the publication of periodic assessment reports (see "Second Assessment Report" and "Third Assessment Report") <http://www.ipcc.ch/>

Invasive Species - "Invasive species" are defined as exotic species that threaten ecosystems, habitats or species in the project area, as identified in the Global Database of Invasive Species (<http://www.issg.org/database>) and from local knowledge and scientific literature.

Key Biodiversity Areas - Areas of global significance for biodiversity conservation, that meet criteria based on a system of vulnerability or the fact that they are irreplaceable, defined in terms of threat levels to species or populations: www.iucn.org/dbtw-wpd/edocs/PAG-015.pdf.

Land Use, Land Use Change and Forests (LULUCF) - Part of the Kyoto Protocol for land-use-based activities that have the potential of impacting carbon stocks and emissions.

Leakage - Any increase in GHG emissions occurring outside the project boundaries that result from project activities.

Other local actors - The main groups potentially affected by project activities that are not living within or adjacent to the project site.

Permanence - The longevity of a carbon sink and its stocks, considering the management and natural disturbances that may affect them. A feature of land-use-based carbon projects is the possibility of reversing carbon benefits, whether through the occurrence of natural disturbances (e.g. fire, disease, pests and other unusual weather events), or the lack of concrete guarantees that the original land use activities will not be resumed after the completion of project activities.

Project Area - The area within the carbon project boundary, which is under the control of the project proponent.

Project Duration - The time period within which the project activities will be implemented.

Project Proponents - Organizations and individuals proposing or advocating for a specific carbon "compensation project. Project proponents may be the responsible technician(s), developer(s) and/or investor(s), or other parties working for the project.

Project Start Date - "The project start date" is defined as the date on which the project began generating GHG emission reductions or removals.

REDD+ - Reducing Emissions from Deforestation, forest Degradation, conservation of stocks, sustainable management and enhancement of forest carbon stocks.

Surrounding Area - The area outside the project boundary, where adjacent communities could potentially be affected by the project.

11. SUPPORTING DOCUMENTS

S/n	Title of the Supplementary material	Number assigned
1	Methodological Review	01
2	Guidance on application of VM0015 Methodology	02
3	Sampling Strategy for Forest Carbon Assessment	03a
4	Revised carbon stock assessment training manual	03b
5	Historical Land Cover Change and Modelling	04
6	Methodological annex/Land-Use Land Cover/	05
7	Capacity building on Forest Carbon Stock Inventory	06
8	Free, Prior and Informed Consent	07
9	Final Carbon Stock Inventory report (revised)	08
10	Capacity building on RS and Land-cover Change Modelling	09
11	Non-Permanence Tool, revised	10a&b
12	Additionality (Cost-benefit analysis)	11
13	Map Shape files	12
14	Inventory datasets (soft copy)	13
15	Inventory datasets (hard Copy)	14
16	Proclamation № 456/2005: Federal Rural Land Administration and Land Use Proclamation	15
17	Federal Proclamation № 542/2007: A Proclamation to Provide for the Development, Conservation and Utilisation of Forests	16
18	Oromia Proclamation 72/2003: Forest Proclamation of Ethiopia	17
19	Oromia Proclamation № 130/2007: Proclamation to amend the Proclamation № 56/2002, 70/2003. 103/2005 of Oromia Rural Land Administration and Use	18
20	Oromia Regulation № 122/2009: A Regulation to Provide for the Establishment of Oromia Regional State Forest and Wildlife Enterprise	19
21	Sample Joint Forest management agreement (JFMAs) signed between forest cooperatives and OFWE	20
22	Five years detailed project activities implementation plan and budget breakdown	21
23	Quality Assurance/Quality Control	22
24	1995 Constitution of the Federal Democratic Republic of Ethiopia	23
25	Benefit sharing negotiation and agreement meeting minutes	24
26	Government and community capacity building plan document.	25
27	Mobility analysis report	26
28	Project annual report 2013 with FPIC process report	27
29	Letter of No Objection	28
30	Agents and drivers of deforestation study report	29
31	Labour laws(OFWE)	30a
32	Workers safety document	30b
33	Grievance redress formalization document	31
34	Wood density data for species in Bale and Ethiopia	32
35	Project financial breakeven point	33