

National Forest Sector Development Program, Ethiopia

Volume II: Program Pillars, Action Areas and Targets



*Empowered lives.
Resilient nations.*



National Forest Sector Development Program, Ethiopia

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Foreword

Ethiopia is highly vulnerable to the impacts of climate change, with droughts becoming more frequent and severe because of its limited potential to mitigate and adapt. Though forests play a critical role on reducing the negative consequences of climate change and contribute to environmental sustainability and the national economy, forests cover loss has continued to be a concern.

Investment in the forest sector is a strategic move to mitigate the impact of climate change and as such is a key component in Ethiopia's national growth and transformation plan. The forest sector is also a strong component of the Sustainable Development Goals (SDGs), particularly SDG 13 Climate Action and SDG 15 Life on Land.

UNDP is a strong advocate for country-led and country-owned strategies that address the underlying causes of deforestation and continues to support Ethiopia's Climate Resilient Green Economy strategy.

Our support to the country to ensure sustainable management of forests has prioritized providing technical and financial support to the Government of Ethiopia in the design and implementation of a 10 years National Forest Sector Development Program.

The National Forest Sector Development Program builds on Ethiopia's existing forest resources, attracts foreign investment and seeks to transform the sector to catalyse GDP growth, employment, promote alternative use of energy sources, environmental protection and sustainable use of forest products as opposed to unsustainable forest exploitation.

Going forward, UNDP's new strategic plan guiding its global work as well as interventions here in Ethiopia will prioritize providing solutions in six areas, namely poverty, resilience, environment, energy, governance and gender equality. Our continued support for the development of Ethiopia's forest sector falls within our priority areas as transforming the sector will catalyse sustainable and inclusive development for the country.

Therefore, UNDP will build on its partnership with Norway and Sweden, to support the sector in key areas such as building institutional capacity, promoting science and research for sustainable use of forests, as well as helping expand the space for private sector involvement in forest conservation and development as well as environmental protection.

These three comprehensive volumes on the National Forest Sector Development Program go a long way to inform forest-related policies, interventions and activities to transform the forest sector in Ethiopia.



Ms. Ahunna Eziakonwa-Onochie

UN Resident Coordinator, UNDP Resident Representative and UN Humanitarian Coordinator



Preface

Forest resources of Ethiopia make a significant contribution to the national economy. With forestry being primarily a rural activity, the sector has enormous potential to contribute to the transformation of the rural economy. The contribution by the sector should also be seen in the value that it adds through harboring biodiversity resources and other ecosystem services such as fertile soil, water and clean air. The contribution of forestry to the quality of life in the urban population cannot be undermined. Therefore, alignment of the growth and transformation of Ethiopia to this critical sector is a requirement.

Over the last one year, the Ministry of Environment, Forest and Climate Change in collaboration with UNDP has given significant time, energy and commitment to the development of the National Forest Sector Development Program (NFSDP). This NFSDP was initiated to be used as the main guiding document for coordinating strategic policy interventions and sector-wide investments for the coming ten-year period. The NFSDP is comprised of three volumes that navigate through situation analysis; a series of transformational action programs and synthesis of investment options that together would help to achieve the forest sector's ambitious development goals in Ethiopia.

These program documents provide a timely update to the 1994 Ethiopian Forestry Action Program (EFAP) by incorporating emerging global and national change agenda. By doing so, the goal is to build on the country's considerable forest resources, attract foreign investment and leverage existing momentum to transform Ethiopia's forestry sector in a way that catalyzes GDP growth, generates employment, contributes towards self-sufficiency in forest products and enhances ecosystem services.

Through the three volumes of the NFSDP, we have been able to put required measures in place to ensure that challenges are addressed and the sector is transformed to the next level. I would like to thank the leadership and the experts involved in the process for their role in the development of this document. I would also like to express my sincere thanks to the stakeholders who have given their inputs and comments throughout the process.

The challenge going forward lies in the successful implementation of the program on the ground. The Government of Ethiopia remain committed to take bold measures in ensuring effective and successful implementation of this program. I call upon all development partners and other stakeholders to strengthen their support and commitment in transforming the forest sector in Ethiopia so that the citizens and Country benefit from the full economic and environmental potential of the sector.



Dr. Gemedo Dalle

Minister, Ministry of Environment, Forest and Climate Change



Table of Contents

- List of Tables 5
- List of Figures 5
- List of abbreviations 6
- Executive Summary 7
- Part 1: National Context** 10
 - The role of NFSDP in achieving Ethiopia’s national targets and international commitments ... 10
 - Forest Resource Status 11
 - Forest Sector Challenges 12
 - Emerging opportunities for forest sector development 13
- Part 2: NFSDP Vision and Development Objectives** 15
- Part 3: NFSDP Development Approach and Process** 17
- Part 4: Forest Sector Development Program Pillars and Action Programs** 19
 - Pillar 1: Enabling environment and institutional development** 19
 - 1.1 Forest policy and law enforcement 19
 - 1.2 Forest sector institutional framework from Federal to Regional levels 19
 - 1.3 Revising the national GDP accounting system related to the forest sector 20
 - 1.4 Human capacity development 20
 - 1.5 Technology development 23
 - Pillar 2: Sustainable forest production and value chains** 29
 - 2.1 Establishing new commercial plantations 29
 - 2.2 Improved management of existing public plantations 33
 - 2.3 Improved commercial management of natural high forests 34
 - 2.4 NTFPs development and commercialization program 35
 - 2.5 Improved management of highland and lowland bamboo resources 39
 - 2.6 Forest industry cluster development 40
 - Pillar 3: Forest environmental functions** 46
 - 3.1 Forest ecosystem services 47
 - 3.2 Forest Biodiversity Conservation 49
 - 3.3 Forest landscape restoration 51



Pillar 4: Forest and Rural livelihoods	54
4.1 Purposeful tree planting to enhance tree growing in rural landscape	55
4.2 Mapping and enhancing the contribution of forest resources to rural livelihoods in forested landscapes	56
4.3 Supporting the development of forest based community enterprises	56
4.4 Formation and strengthening of farmer and community organization for forest based interventions	56
4.5 Rural Energy	57
Pillar 5: Urban greening and urban forests	62
5.1 Urban greening	62
5.2 Urban forests	63
Pillar 6: Cross-cutting components	65
6.1 Gender	65
6.2 Demography	65
6.3 Integrated land use planning for forests	66
6.4 Climate Change adaptation	67
Cost-benefit analysis	71
Investments required to implement the NFSDP	71
Expected benefits from implementation of the NFSDP	74
Sensitivity analysis	76
Part 5: Implementation framework	80
High Political Ambition for Green Economy	80
Strategic communication plan	80
Importance of Regional Forest Sector Development Programs	81
Finance	84
Risks and mitigation	86
Social and environmental safeguards	88
Implementation approach	88
Monitoring, evaluation and support systems	90
References	91
Annex	95
Annex 1: Implementation targets and timeline for all NFSDP pillars	95
Annex 2: CBA Assumptions	99
Annex 3: Proposed Multi-stakeholder platforms in implementing NFSDP	109
Annex 4: Existing regional institutions relevant to forestry	112



List of Tables

Table 1: Pillar 1 Action program areas and implementation strategies	24
Table 2: Pillar 2 Action program areas and implementation strategies	43
Table 3: Per hectare costs and benefits of pillar 2 activities	45
Table 4: Current and projected industrial wood demand in Ethiopia by product type excluding construction wood need	46
Table 5: Pillar 3 Action program areas and implementation strategies	52
Table 6: Per hectare costs and benefits of activities	54
Table 7: Pillar 4 Action program areas and implementation strategies	59
Table 8: Pillar 5 Action program areas and implementation strategies	64
Table 9: Pillar 6 Action program areas and implementation strategies	70
Table 10: Cross-cutting assumptions	72
Table 11: Nominal costs (all costs in USD millions)	74
Table 12: Summary of costs and benefits (all costs and benefits in USD millions)	75

List of Figures

Figure 1: Current and required GDP contribution of the forest sector	8
Figure 2: Mitigation impact of the NFSDP compared to NDC targets	11
Figure 3: Ethiopia National Forest Sector Development Program Pillars	16
Figure 4: Overview of the three phases	17
Figure 5: Benefit/cost ratio of selected investments	76
Figure 6: Sensitivity analysis for discount rate	77
Figure 7: Sensitivity analysis for wage rate	78
Figure 8: Sensitivity analysis for price of carbon	79
Figure 9: Overall potential for tree-based landscape restoration	82
Figure 10: Potential development finance partners	85



List of Abbreviations

CBA	Cost-Benefit Analysis
CRGE	Climate-Resilient Green Economy
EBI	Ethiopian Biodiversity Institute
EEFRI	Ethiopian Environment and Forest Research Institute
ETB	Ethiopian Birr
FDRE	Federal Democratic Republic of Ethiopia
FLR	Forest Landscape Restoration
FSR	Forest Sector Review
FTC	Farmers Training Centers
GHG	Greenhouse Gases
GTP	Growth and Transformation Plan
HWP	Harvested Wood Products
INDC	Intended Nationally Determined Contributions
JFM	Joint Forest Management
MDF	Medium Density Fiber Board
MEFCC	Ministry of Environment, Forest and Climate Change
MoA	Ministry of Agriculture (previous Ministry)
MoANR	Ministry of Agriculture and Natural Resources
MoLF	Ministry of Livestock and Fishery
NDC	Nationally Determined Contribution
NFPA	National Forest Priority Area
NFSDP	National Forest Sector Development Program
NFI	National Forest Inventory
NRM	Natural Resource Management
NTFP	Non-Timber Forest Product
PES	Payment for Environmental Services
PFM	Participatory Forest Management
PPP	Public Private Partnership
RWE	Roundwood Equivalent
SDGs	Sustainable Development Goals
SNFM	Sustainable Natural Forest Management
SLM	Sustainable Land Management
SMFE	Small and Medium Forest Enterprises
SNNPR	Southern Nations, Nationalities and Peoples' Region
TVET	Technical and Vocational Education and Training
UNESCO	United Nations Education, Scientific, and Cultural Organization
USD	United States Dollar



Executive Summary

Ethiopia's diverse forest resources, including high forests, woodlands, and trees on farms, provide goods and services of important value to Ethiopia's people, environment and economy. The Government of Ethiopia has stated a strong interest in strengthening the contribution of the forest sector to achieving economic growth and to ensure the social and environmental sustainability of this growth. With 17.35 million hectares of forests covering 15.7% of the national territory and a large expanse of degraded lands suitable for forest restoration, Ethiopia has huge potential to develop the forest sector to contribute to Ethiopia's sustainable growth.

This National Forest Sector Development Program (NFSDP) is a country-driven initiative instigated by Ethiopia's Ministry of Environment, Forest and Climate Change (MEFCC) as the main guiding document for coordinating strategic policy interventions and sector-wide investments for the coming ten-year period. The goal of the NFSDP is to provide the master plan that serves as the roadmap for future forestry actions across sectors and Ministries and considering the mandate of the regions in the constitution. The NFSDP also contributes to mobilize funding and coordinate support. Given that successful forest sector development requires collaboration across many sectors and institutions, this NFSDP highlights the important role of many sectoral Ministries beyond MEFCC in the successful implementation of the NFSDP.

The forest sector has been receiving pronounced attention from the Government of Ethiopia, as the forest sector plays a central role in realizing the country's commitment to achieving a Climate-Resilient Green Economy (CRGE). The CRGE strategy aims to build a middle-income and climate-resilient economy with a zero net increase over the 2010 baseline emission, in national greenhouse gas (GHG) emissions by 2030. The forest sector has the potential to contribute significantly to Ethiopia's climate mitigation ambitions, with the national REDD+¹ strategy estimated to contribute 50% of GHG emissions reduction between 2010 and 2030.² Forests play a central role in maintaining Ethiopia's invaluable forest biodiversity³, providing critical habitat for flora and fauna and also protect agricultural biodiversity. The Forest Sector Review (2015) explains how the forest sector is a strategic component of Ethiopia's transformation towards a more prosperous and industrialized economy, given investments in forest plantations and accompanying industries support manufacturing, export diversification, import substitution, and rural development goals. With the right interventions and policy adjustments, the forest sector has the potential to expand its contribution to sustainable economic development, creating green jobs and fostering climate change adaptation.

1 REDD+ stands for Reducing Emissions from Deforestation and Forest Degradation, forest conservation, sustainable forest management and forest carbon stock enhancement through afforestation and reforestation.

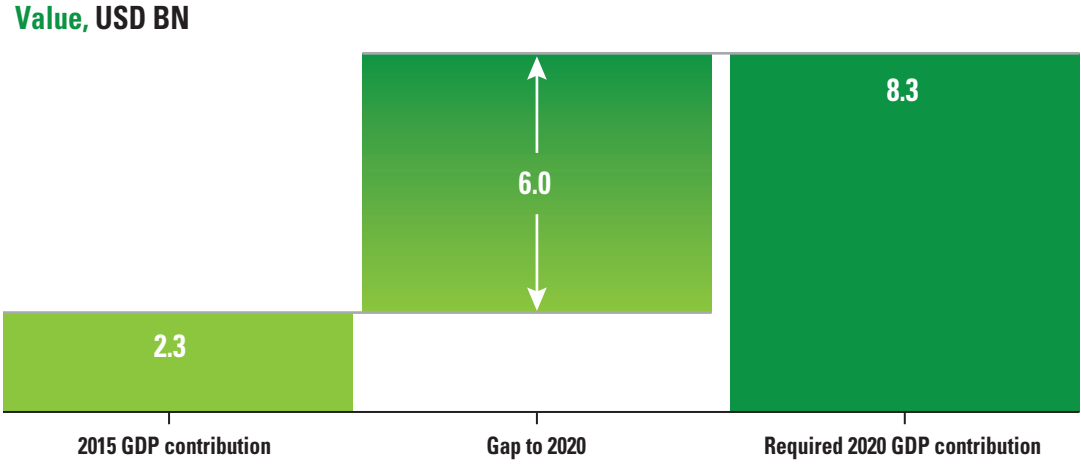
2 FDRE MEFCC, National REDD+ Secretariat. National REDD+ Strategy (2016-2030). Final Draft, June 2016.

3 See FDRE's National Biodiversity Strategy and Action Plan 2015-2020. Ethiopia Biodiversity Institute, Addis Ababa, Ethiopia.



In addition to helping Ethiopia achieve environmental objectives, the forest sector can play an important role in contributing to economic growth. Successful NFSDP implementation would double the percentage contribution of the forest sector to national GDP, from 4% to 8%. This represents a growth in absolute GDP from USD 2.3 billion to 8.3 billion (Figure 1). Moreover, implementation of the NFSDP is expected to create more than 630,000 full-time jobs, primarily in rural areas.

Figure 1: Current and required GDP contribution of the forest sector⁴



This NFSDP document outlines the main pillars, or action program areas, around which the NFSDP will be built, namely:

- Enabling environment and institutional development
- Sustainable forest production and value chains
- Forest environmental services
- Forests and rural livelihoods
- Urban greening and urban forests

⁴ To reach NFSDP targets; Image from National Forest Sector Development Program Review. December 2016.



Each action program area includes specific actions that detail the type of interventions or activities proposed to develop the forest sector, as well as the specific stakeholders that will be involved in implementation. Each action has a corresponding target. Together, these targets make up the overall objective of the NFSDP. The implementation costs and expected benefits of achieving these targets are estimated in a cost-benefit analysis. In total, the NFSDP is expected to generate 3.3 dollars of benefit for every dollar invested.

The National Forest Sector Development Program was informed by a comprehensive Situation Analysis (Volume I) of the forest sector, including analysis of status quo, trends, barriers and opportunities for development. Volume I, Situation Analysis, received stakeholder feedback during a national workshop from June 30-July 1, 2016 to ensure broad agreement on the key issues and areas that should be covered in the current programmatic action formulation phase. NFSDP Volume II benefits from a series of regional and national stakeholder consultations from August 1-6, 2016, where the draft action programs were presented and discussed with key regional and national stakeholders.



Part 1: National Context

The NFSDP is a country-driven initiative that serves as a master plan for the enhancement of sustainable forest management in the country over the next 10 years, i.e. from 2016-2025. Secondly, the NFSDP will serve as the basis for the development of Regional Forest Sector Development Programs. It serves as a guiding document for policy makers, development partners, NGOs, CSOs and the private sector outlining the key actions that will lead to transformation of the forest sector. Forest sector stakeholders now have the opportunity to adopt a more comprehensive approach to promote sustainable and productive forestry.

The role of NFSDP in achieving Ethiopia's national targets and international commitments

The National Forest Sector Development Program (NFSDP) has been fully aligned with the Government of Ethiopia's existing national targets and contributes to achieving Ethiopia's international commitments. Ethiopia has developed a Climate-Resilient Green Economy (CRGE) strategy that aims to build a climate-resilient green economy and to make the country carbon neutral while attaining middle-income status by 2025. The CRGE strategy identifies the forest sector as one of the key pillars for the attainment of the CRGE vision. A core element of this CRGE vision is sustainable landscape management, given the recognition that land use is the largest source of GHG emissions (88%)⁵, and interventions in the land use sector contribute to social and environmental objectives such as food security, watershed and biodiversity protection. The CRGE is also integrated into the Second Growth and Transformation Plan (GTP 2), which aims to develop the country through industrialization, investment in value adding and processing. This NFSDP serves as the umbrella framework for translating the CRGE and GTP 2 objectives into the actionable measures required to achieve these national objectives.

In terms of international commitments, the NFSDP contributes to achieving Ethiopia's Nationally Determined Contribution to the United Nations Convention on Climate Change Paris Agreement (FDRE, 2015). Ethiopia has committed to reducing its carbon emissions by 255 million tons CO₂e per year by 2030, 130 million tons of which are to come from the forestry sector. The NFSDP would allow the forestry sector to more than meet this goal, mitigating nearly 160 million tons CO₂e per year by 2030 (Figure 2). The international commitments Ethiopia has made under the Bonn Challenge and reconfirmed under the UN Summit in New York in 2014 have also been integrated into this NFSDP.⁶ In this context, Ethiopia has committed to restoring 15 million hectares of forest landscapes by 2030 in addition to carrying out afforestation and reforestation and sustainable management of forests and woodlands on 7 million hectares in the next 10 years. Achieving all of the targets of the NFSDP would result in a large contribution to climate change mitigation and Ethiopia's Nationally Determined Contribution (NDC),

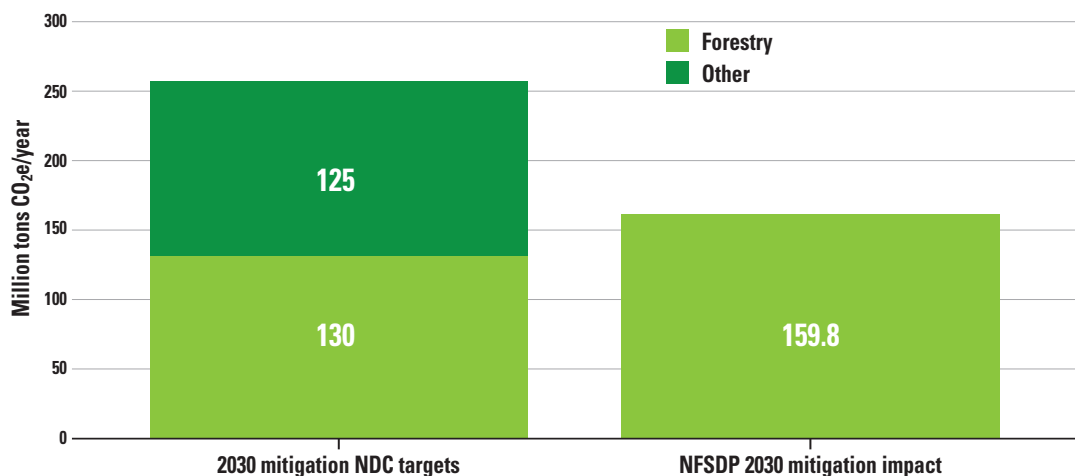
⁵ The main activities responsible for GHG emissions within Ethiopia's land use sector are livestock (42% of total national emissions), deforestation and forest degradation (37%), and agriculture (9%) (FDRE 2015).

⁶ In 2014, the New York Declaration on Forests was endorsed by more than 130 governments, companies, civil society and indigenous peoples' groups. As of April 2016, countries and private actors have pledged to restore 93 million ha, with an estimated sequestration potential of approximately 6 Gt of CO₂e and economic contributions of app. USD 20 billion (cf. <http://www.bonnchallenge.org/content/challenge>).



sequestering more than 1 billion tons of CO₂e. Moreover, the NFSDP contributes to the country's commitment to UNCCD Land Degradation Neutrality target and CBD Aichi Nagoya target to increase the coverage of protected areas to 17%.


Figure 2: Mitigation impact of the NFSDP compared to NDC targets



Forest resource status

Ethiopia's biodiverse forest resources, including high forests, woodlands, and trees on farms, provide goods and services of important value to develop Ethiopia's green economy and achieve prosperity and a middle-income status by 2015. The Government of Ethiopia has a stated interest in strengthening the contribution of the forest sector to achieving economic growth and to ensure the social and environmental sustainability of this growth. With 17.35 million hectares of forests covering 15.7% of the national territory and a large expanse of degraded lands suitable for forest restoration, Ethiopia has huge potential to develop the forest sector to contribute to Ethiopia's sustainable growth.

Due to its large land size and diverse topography and agro-ecological zones, the country is comprised of various natural and man-made vegetation types that fulfill the definition of forest. In Ethiopia, forest is defined as land occupied with trees (natural and planted, including bamboo) attaining a height of more than 2 meters at maturity, canopy cover of more than 20% and covering an area of more than 0.5 ha, with a minimum width of 20 meters. The soon-to-be available World Bank financed and FAO supported National Forest Inventory will provide consistent and reliable data on forest cover, standing stock, growth rate and species composition. Existing estimates from different sources vary considerably. For the NFSDP the recent study by the Ethiopian Mapping Agency was used. The majority of Ethiopia's relatively undisturbed remnant natural forests are located in two major blocks in the south west and south east while there are only a few remnants of degraded forests in the other parts of the country.



Largely due to Ethiopia's diverse forest ecosystems, the country is one of the top 25 biodiversity-rich countries in the world (WCMC, 1994) and hosts two of the world's 34 biodiversity hotspots, namely the Eastern Afromontane and the Horn of Africa hotspots. A significant amount of forest resources with high biodiversity and tourism importance are designated as protected areas. According to the EBI (2015), protected area networks account for 14% of the country's land area.

Forest sector challenges

Wood product demand is growing fast in Ethiopia due to population and economic growth. The construction sector boom, growth in urbanization and urban population, and growing middle class is driving rapid growth in demand for wood and other forest products (FSR, 2015). At national level, there is huge gap between demand and domestic sustainably produced supply of wood products. This has triggered two economically unfavorable outcomes. First, it is driving unsustainable extraction of wood from the natural forests, and hence the degradation of forests and loss of biodiversity. Second, this forces the country to depend heavily on imported wood products for its wood-based industries. In 2015 alone, Ethiopia imported 3.006 million m³ RWE of various industrial wood products worth ca. USD 182.53 million, and the trend of importation is increasing. In fact, it is more than doubled between 2007 and 2015. Unless actions are taken swiftly, the situation will drive further degradation of the natural forests and affect the foreign exchange reserves. This justifies that the country must prioritize the establishment of professionally managed commercial forest plantations to produce the quality wood products increasingly demanded on the domestic market.

Although protected area networks account for 14% of the country's land area (EBI 2015), most of these protected areas are not yet demarcated and announced in the official gazette.

Land and forest degradation, often caused by deforestation, is a severe problem in Ethiopia, causing low agricultural productivity, food insecurity, and rural poverty. Ethiopia's population in 2012 was estimated at 81.8 million (CSA 2017), with 83% of the population living in rural areas, dependent on smallholder agriculture including livestock production as main economic activity. The impacts of human activities on forests have been significant, with average annual deforestation rates estimated at 85,000 ha per year (GoV 2016). Ethiopia's forests are increasingly under threat as the growing population requires more fuelwood and agricultural products, which leads to farmland expansion. Road, energy and water infrastructure construction is also accelerating deforestation and forest degradation. Projections indicate that unless action is taken to change the traditional development path, an area of 9 million ha might be deforested between 2010 and 2030 (CRGE 2011).

Human and institutional capacity development is a serious bottleneck to Ethiopia's forest sector development. Skilled human resource availability is important for the entire cycle of sustainable forest management, from the establishment and maintenance of forests and trees to proper harvesting, processing and marketing of products and services. The prerequisite to effective sector development,



including attracting private sector investments, is the existence of technically capable and efficient human resources. Today, the quality and quantity of skilled man-power in the forest sector is critically low. Unless addressed immediately, this can be a major hindrance to materialize the desired development and industrialization of the sector. Due to existence of these multiple challenges the NFSDP is designed in a comprehensive way to address these challenges. The action programs proposed in the NFSDP are holistic and needs engagement of multi-stakeholders by putting in place effective intersectoral coordination.

Emerging opportunities for forest sector development

It is globally recognized that the forestry sector has tremendous potential for protecting the environment and spurring transformational economic development. Public-private sector initiatives such as the African Forest Landscape Restoration Initiative (AFR100) – of which Ethiopia is a major player – that aims to restore 100 million ha of deforest-ed or degraded land by 2030 aim to implement an integrated approach for reducing the pres-sure on forests and rehabilitating degraded forest lands, in particular through the transfor-mation of supply chains and afforestation and reforestation. There are also growing efforts driven by civil society and private actors in the context of sustainable production, certification and company supply chains. As of 2016, there were over 400 companies with public commit-ments to reduce or eliminate deforestation in their supply chains, in most cases these pledges were integrated in broader sustainability policies (Climate Focus 2016).

The Government of Ethiopia has prioritized reversing deforestation and forest degradation as a strategy for achieving sustainable economic growth. As Ethiopia continues to experience rapid economic growth, the role of the forest sector becomes increasingly important in achieving the Government’s ambitious climate-resilient green growth goals. It is broadly recognized that forests provide vital ecosystem services including the regulation of water and climate through the role they play in the water and carbon cycles. Afforestation, reforestation and sustainable forest management for carbon stock enhancement and the protection and sustainable use of biodiversity is required to enhance the flow of ecosystem service and products. In the context of climate change, Ethiopia’s forest and land use sector is unique in that properly planned and implemented investments to improve land and forest productivity can result in both mitigation and adaption benefits. Ethiopia thus has the opportunity to benefit from significant climate finance through interventions in the forest sector.

In addition, the forest sector has a great potential to expand its contribution to sustainable economic development, including creating green jobs, supporting the bio-economy and fostering climate change resilience, through high-value activities such as commercial plantations, NTFPs and sustainable agricultural and grazing practices.



The above-mentioned opportunities have been captured in forest sector development planning process to increase the contribution of the sector to the country's economic development. Some of the key enabling conditions to seize these opportunities include:

- Political commitment of the government to build a green economy based on renewable resources such as sustainably and domestically produced wood products;
- Growing recognition of Ethiopia in the international and continental climate change, forest and environment related policy processes;
- Investment in public infrastructure, particularly in roads, railways and energy, which helps the forestry sector to become more productive and competitive;
- The booming construction sector creates huge demand for raw and processed wood products (the construction sector accounted for nearly 50% of the share of industry in GDP during GTP I);
- Clean and cheap energy supply enhances the competitiveness of wood-based manufacturing industries compared to neighboring countries in the region;
- The ongoing rural electrification program reduces pressure on forests for energy and creates significant opportunities for the production of utility poles;
- A continued rise in the working age population provides the opportunity for labor intensive forestry programs and projects;
- The growing economy of the country increases the purchasing power of citizens, which in turn increases demand for quality wooden furniture and construction materials.



Part 2: NFSDP Vision and Development Objectives

The overall vision of the NFSDP is to build on the country's considerable forest resources, attract foreign investment (both donor and PPP) and leverage existing momentum (e.g., creation of MEFCO) to transform Ethiopia's forestry sector in a way that catalyzes GDP growth, generates employment, contributes towards self-sufficiency in forest products and enhances environmental services.

Successful implementation of the NFSDP would result in achieving Ethiopia's medium-term (five-year) and long-term (ten-year) objectives:

- Increasing the forest cover from current 15.7% to 20% by 2020
- Doubling contribution to GDP from 4% to 8% by the end of GTP 2
- Attaining wood product self-sufficiency within the next ten years

In addition, the NFSDP has a number of objectives for each of the specific pillars, namely:

- Enabling environment and institutional development: to strengthen the existing conducive policy and legal framework and develop the required institutional, human and technological capacity to implement the NFSDP at all levels.
- Sustainable forest production and value chains: to ensure Ethiopia is self-sufficient in industrial wood products including full substitution of import by 2040, and enhance the forest sector contribution to the GDP by expanding forest sector industrialization both from wood and non-wood products.
- Forest environmental functions: successful implementation of REDD+ guarantees that the forest sector achieves 50% of the national emissions reduction target set in the CRGE; the value of the services provided by forest ecosystems is increased.
- Forest and rural livelihoods: to ensure soil fertility for the sustainable intensification of food production, sustainable construction and fuelwood supply and increase the value of trees in forest landscapes to contribute to poverty reduction, food security and sustainable development in rural areas.
- Urban greening: to ensure the central role of trees and forests in contributing to the urban livelihood and improved living standard, including air quality, of the increasing urban population.

MEFCO initiated the development of this NFSDP to provide the master plan that serves as the roadmap for future forestry actions at the federal and regional level. As shown in, Ethiopia's National Regional States have the mandate to implement actions related to natural resource management. Therefore, the subsequent development of regional forest action programs should be carried out immediately following the validation of this national strategic document to thereby ensure its successful implementation. The main NFSDP pillars, or action program areas, are shown in Figure 3.



Figure 3: Ethiopia National Forest Sector Development Program Pillars



Part 3: NFSDP Development Approach and Process

The NFSDP was developed based on broad stakeholder participation, with multi-stakeholder consultations providing key inputs for the program development. The formulation of the NFSDP (2016-2025) is conducted in three phases (Figure 4). In phase 1: “Situation Analysis” the current forest sector status quo and trends, barriers as well as opportunities were analyzed in depth. Moreover, the review of international best practices relevant to the Ethiopia’s forest sector is presented as a stand-alone document. In phase 2: “Action Programs”, the draft action programs covering key issues of the forest sector were identified for all program pillars and further enriched through regional and national level consultation processes. In phase 3: “Synthesis”, a concise summary of the NFSDP and the cost and benefit analysis of the proposed action programs will be presented. A summary of the investment needs will enable mobilization of resources for the implementation of the NFSDP. Cost estimates are calculated using bench-marks from similar interventions and the overall targets formulated in the NFSDP. The results of each phase constitute an autonomous volume in the NFSDP.

Figure 4: Overview of the three phases





In addition to the review of national document analysis and international best practices, this NFSDP benefits from a series of stakeholder consultation workshops carried out at the regional and national level. The main consultations include:

- Kick-off meeting with MEFCC Ministers, consultant team and client: May 5, 2016
- National workshop to present and gather feedback on the Situation Analysis (Addis Ababa): June 30-July 1, 2016
- Programming workshop at regional level: August 1, 2016 (Bahir Dar) and August 3, 2016 (Hawassa)
- Programming workshop at national level (Bishoftu): August 5-6

The detailed feedback and comments provided during these meetings and subsequently have been captured in this Synthesis Report (see Annex for stakeholder workshop agenda and minutes).



Part 4: Forest Sector Development Program Pillars and Action Programs

Part 4 presents the program pillars, first explaining the relevance and importance of each action program, providing problem statement, rationale and important background information relevant for the program action areas and proposed implementation strategies. Thereafter, the action program areas and implementation strategy components are presented in concise and easy-to-follow summary tables. The disaggregated costs are presented for each action to concurrently inform policy-makers and development partners with the financial implications of the NFSDP.

Pillar 1: Enabling environment and institutional development

1.1 Forest policy and law enforcement

Existing policy and proclamations must be supported by legislative regulations and implementation frameworks to provide the basis for concrete action plans. The incentives that are stipulated by the forest policy are not implemented to the required level and thus, most forest users are unaware of them. The revision of the forest proclamation is almost finalized, and the draft forest proclamation takes into account the current changes in institutional set up at federal level and capitalizes emerging opportunities such as climate benefits of forests. At the same time, ME FCC is developing relevant regulations and guidelines that are required to operationalize the forest policy and strategy. The forest proclamation and subsequent regulation should clarify forest and tree tenure and rights including ownership and transfer of carbon rights, and should establish the legal framework for payment for ecosystem services. Further, ownership and management of existing community forests should be clarified, amongst a range of other issues. Moreover, efforts should be made to harmonize the forest law with other laws in the land use sector. Issues that need harmonization are agroforestry and watershed management under MoANR, wildlife development and conservation under MoCT, biosphere reserve management under MoST, rural energy development under MoWIE, etc.

1.2 Forest sector institutional framework from Federal to Regional levels

The Ministry of Environment, Forest and Climate Change (ME FCC) is responsible for forestry. However, other institutions have been given responsibility to engage on issues related to forestry, such as agroforestry, wildlife conservation, biosphere reserves and watershed management.

During stakeholder consultations made at regional and national levels, a strong recommendation was made to avoid the fragmentation of efforts. Therefore, there should be institutional revision on mandates to avoid duplication of efforts.

ME FCC requires setting up and institutionalizing information systems to ensure information and data sources are made available to stakeholders of the sector. The lack of up-to-date and reliable data is a major constraint in the policy making process, which can lead to setting unrealistic targets. Thus, there is a need to improve the quality of data upon which national policies and proclamations can be based and to further coordinate the flow of information at multiple levels of government.



Large-scale forest development requires preparedness to handle safety related problems to be encountered such as fire, pest and disease outbreaks. Forest safety is a matter of serious concern to the forest resources and may increase forest investment risks. In the absence of a well-organized, quick to act and well equipped service provision that responds to emergencies in the case of forest fire and/or pest/disease outbreak, the risk in forest resources will be too high, and can be a hindrance to further investment. Developing such a capacity at national level should therefore be part of the NFSDP. This action is relevant for commercial plantations, natural forests and woodlands and therefore, a comprehensive forest safety program must be developed at the national level that can be adopted to fit the needs of different forest land-scape types.

1.3 Revising the national GDP accounting system related to the forest sector

The national GDP accounting system should be revised to better reflect the significant role of the forestry sector in Ethiopia's national and local economies. Aggregate data on economic values and production of forest products and services are fragmented and inadequate. The recent official statistics (MoFEC 2015) show the sector's contribution to total GDP to be 3.3% in FY2014-15. A number of studies suggest this statistic does not entirely capture the full contribution of the forest sector to the economy. A recent study (MEFCC 2016) reports that in FY2012-13, Ethiopia's forests generated economic benefits in the form of cash and in-kind in-come equivalent to USD 16.7 billion (111.2 billion ETB), or 12.9% of the measured value of GDP. The current National GDP accounting system lacks indicators that capture the value of Ethiopia's forest ecosystems services. Moreover, some of the goods obtained from the forestry sector such as forest coffee are accounted for as agricultural sector. Therefore, there is a need to revise the existing national accounting methods related to the sector by integrating indicators that value the ecosystem services provided by the country's forest resources.

1.4 Human capacity development

Successful NFSDP implementation requires training professional human resources with specific forestry-related skills. Different levels of experts are needed to provide the required technical and managerial support to forest developers, whether private or public. Despite the expanding TVET and higher education institutions, the forest sector in Ethiopia suffers from a severe shortage of adequately trained and skilled forestry technicians and experts. Education tailored to forestry is, therefore, among the priority interventions required for transformation of the forest sector. A sufficient number of well-trained forest rangers and experts should be formed through TVET and university level forestry training. In addition, public training centers should be re-initiated and strengthened in the country. School clubs and community training should also be considered as promising approaches for human resources development. Forestry and environmental education should also be included in elementary and secondary school teachings not only to raise citizen awareness about environmental issues and forest functions but also to create motivation among students early on so that they will select forestry as their future career.



Given the peculiarity of forest development and processing, particularly when it is commercially oriented, dedicated and adequately trained forest rangers (extension agents) are needed. Forest extension in Ethiopia has been provided as a subset of agriculture and NRM extension services, housed under the MoANR. Due to the previous crop focused mission of the then MoA, extension service paid more attention to crop and watershed protection services, while forest development and industrialization remained largely overlooked. Forest developers, whether private, public or farm households, should get quality advice and services on various aspects of forest development such as species selection (what to plant), quality seed and seedling production, planting techniques, stand management, harvesting and processing, and entrepreneurial skills for forest owners and managers. Such advice should be provided by forestry extension agents or forest rangers that are adequately trained and skilled in the subject matter. Having forestry extension reach the broader community is expected to play an important role in catalyzing transformational change in the sector.

Dedicated TVET colleges are needed for forest ranger training. 8,500 Farmers Training Centers (FTC) have been established to provide extension services to farm households. NFSDP implementation needs to make use of these infrastructures to demonstrate best results and an estimated 15,000 FTCs will be required — one FTC per rural Kebele. However, as not all rural Kebeles are suitable for forestry development, the recommendation was for the Kebeles to be prioritized based on location for example Kebeles and districts with woodlands of high commercial value for NTFPs.

Skilled professional foresters and forest industry experts with higher academic ranks are needed to support Ethiopia's forest sector development ambitions. This is required for proper forest development planning, proper stand management, wood and non-wood processing, bio-product engineering, research and innovate and guide development of the whole sector. College forestry training currently relates mainly to classical forestry. This training must be improved to embrace the global trends of modernization and commercialization driven by innovation through research. Existing training systems must integrate forest business and green enterprise cases including forest industries and processing of NTFPs specifically to the Ethiopian context. The few attempts to include forest industry training in engineering faculties such as at Adama University were short lived. Wondo Genet College of Forestry has begun offering a BSc level training in wood product utilization in recent years, but the quality of teaching must be improved.

Transformation is needed as part of the NFSDP to improve forestry education in Ethiopia, both in resource base development and forest industry. Successful pilot programs such as ARBONETH should be built upon and scaled up by increasing education networks throughout the country.⁷ Transforming the forestry education system in the country also needs to consider the following issues:

7 ARBONETH (www.arboneth.com) provides an example for how to optimize student curricula and teaching facilities. The ARBORETUM program provided students with a space of knowledge and recreation where they can experience the diversity of 100 different old-grown tree species. With new pathways and an information center, the colleges' school of forestry can use the Arboretum for dendrology trainings. Such ex situ collections are necessary to conserve knowledge and make it usable for students to study and similar improvements are planned for Haramaya Universities old Arboretum and the National Herbarium of the Addis Ababa University.



- **New curricula development:** University forestry teaching has to be reformed by developing new and flexible curricula to produce graduates that best fit the current and future forest sector development agenda and the needs of the country such as commercial forestry, private forest investment, forest industrialization, forests for green growth and the like. The education system should be more career-based and have a practical orientation, for example by including a 3-month compulsory '**preparatory practical course**', and at least a one-year forest industry internship after graduation from university before being employed as a fulltime employee. The design of the curricula should focus on balancing theory with practical teaching, innovation and in-depth understanding of the challenges in the sector including **professional motivation and dedication**. Curricula design and revision processes should allow for active guidance to be provided by state forest enterprises, private forestry/timber processing entrepreneurs, NGOs, experienced experts from abroad and research organizations. On top of practical hours attached to each course, additional compulsory practical teachings should be integrated into the curricula such as 3-months of applied forestry as a preparatory practical course in first year; field school and industry tours during subsequent years; a month of field camping for management plan preparation and others to develop a mix of technical and professional skills and knowledge in graduates.
- **Quality student enrollment:** Students should be selected not only in accordance with their exam results but also based on professional preference and inclination, and their willingness to live and work in rural areas. Forestry training universities, with support from MEFCC and other government entities, should negotiate with the MoE placement department to select students based on their preference. Universities should also use various promotional campaigns to motivate students to opt for forestry as their future career path. Moreover, the first three to six months after starting university should be spent on building motivation and attitude by providing attractive and practical oriented preparatory education.
- **Enhancing teaching staff capacity:** Among others, teaching staff should have sufficient industry/field experience, of at least 5 years. Recent graduates recruited as university teachers should be offered two-year internships in forest industries/companies before becoming involved in full time teaching. Different mechanisms should also be adopted by universities to increase teaching staff motivation, such as performance based rewards. Strong internal control systems to monitor the performance of teaching staff should be improved, and continuous capacity building through short-term training must be offered. A rigorous accreditation procedure for forestry teachers is also recommended to ensure high standard teaching staff.
- **Acquisition of sufficient teaching facilities:** Sufficient teaching facilities as well as class room and outdoor facilities are essential requirements for practical classes and problem solving teaching. Universities and colleges teaching Forestry should have sufficient tools, equipment, laboratories, nurseries, greenhouses and forest stands to provide practical training.



Formal education alone is not enough to produce adequately qualified forestry personnel. Regular on-job (in-service) training with short courses, focusing on new technologies and techniques and managerial skills should be provided to upgrade the skills and knowledge of forest workers. Such refresher training courses can best be offered in specialized training centers. Short-term courses related to sustainable forest management, forest economics, outgrower schemes and forest concession, forest products value chain, NTFPs, modern nurseries and seed technology and forest utilization can be considered. However, a needs assessment should be conducted prior to organizing such courses as gaps may vary.

1.5 Technology development

Research is fundamental to innovating and guiding the development and modernization of the forestry sector. Forest sector advancement of many countries has been led by research. Forestry research has historically been hosted under the agricultural research institute, often with marginal funding and being poorly equipped. Most of the laboratory facilities are now outdated and most equipment is worn out or out of order. The EEFRI is a federal research institute with 7 branches distributed across the country covering different ecological and socio-economic settings. The branches are centrally managed by the EEFRI headquarters in Addis Ababa, including budget, human resources and planning of research. The NFSDP proposes to modernize laboratory facilities to support forest sector transformation, for instance related to genetic improvements such as cloning. The NFSDP will fully support the recently established Ethiopia Environment and Forest Research Institute (EEFRI) to ensure the EEFRI strategic plan and targets are met. In parallel, the research-extension linkage must be improved to ensure research findings are adapted by the relevant stakeholders.

Ethiopia's ambition to modernize and commercialize its forest sector requires quality seed and seedlings. Quality seed production has a critical effect on the growth rate, health and quality of trees and stands that will be obtained at the end. For quality seed production, seed orchards or hedges for cuttings should be developed. These should be developed around and connected to the four seed centers recently established in the country. Genetic improvement and integrated pest management research is also crucial. The tree seed centers should be upgraded and closely work with research institutes to implement applied research and long-term trials. When establishing seed orchards, the following steps need to be followed:

- Acquire prime land (suitable land) of sufficient size in locations that are close to areas targeted for forest industry cluster development (Pillar 2.6);
- Identify tree species for which seed orchards are to be established. These will be proven exotic and indigenous species, which are in high demand for commercial timber plantation or Non-Timber Forest Products development;



- Select and acquire reproductive material (germplasm) of the highest quality for first generation seed orchards. The genetic gain of seed orchard crops depends primarily on the genetic superiority of the orchard parents, the genetic contribution to the resultant seed crops, and pollen contamination from outside the seed orchards. The germplasm can be acquired from outside but from a known genetic material of high quality or material collected from existing plantation stands through the correct selection of mother trees of outstanding phenotypical attributes;
- Care should be exercised in establishing the seed orchard to arrange trees by keeping related individuals or cloned copies apart from each other to avoid inbreeding effect;
- Develop a strategy and plan for further improvement of the seed orchards through breeding.

Table 1: Pillar 1 Action program areas and implementation strategies

Program area	Implementation strategy components	Expected costs
Forest policy and law enforcement	Enact the revised forest law/proclamation to create the legal enabling framework for the sustainable management of forest resources in a way that provides social, economic and environmental goods and services sustainably.	USD 30,000
	Approve the draft forest regulation to operationalize the forest policy, strategies and proclamation. The forest regulation and associated subsequent guidelines should make existing policy-based incentive packages operational and provide additional incentive frameworks to motivate smallholder farmers, communities, and private sector and public enterprises to implement the designed action program. The regulation will establish incentive mechanisms to address carbon storage, watershed protection and biodiversity conservation benefits of forests in a coherent and integrated system.	USD 30,000
	Develop directives and guidelines to operationalize the forest policy proclamation and regulation in the following areas: <ul style="list-style-type: none"> • Private forest concessions development and management; • Incentive packages for forest investment by private investors, smallholder farmers, orga-nized professionals; • Benefit sharing mechanisms when multiple actors at different levels are engaged in sustaina-ble forest management (carbon, PES, etc.); • Joint ventures/public private partnerships; • Code for sustainable forest management; • Seed/planting material quality control and certification; • Timber and NTFP quality standards and certification. 	USD 40,000



Program area	Implementation strategy components	Expected costs
Forest policy and law enforcement	<p>To review implementation of the forest policy, strategy and proclamation to ensure law enforcement, the following actions will be taken:</p> <ul style="list-style-type: none"> • Establish a system to identify forest products produced from sustainable and legal sources - differentiating products from a) planted forest resources; b) managed natural forests; and c) other (illegal/unsustainable) sources; • Monitor and regulate harvesting and trade of wood products from natural forest, to minimize illegal exploitation and to ensure a realistic market price of forest products; • Harmonize forest products production and trade licensing. 	<p>The costs for this activity are covered entirely by GoE staff time.</p>
Forest sector institutional framework from Federal to Regional levels	<p>Support regional institutional strengthening and development of Regional Forest Sector Development Programs, including the establishment of institutional frameworks from federal to regional and local levels to align with MEFCC's federal mandate to develop and implement Programs in environment, forestry and climate change (see Annex 2 for proposed institutional set-up). There is an urgent need to establish and/or designate dedicated institutions to govern forest resources at the regional level with cascaded structures to the local level and taking into account regional specificities such as public forest enterprises.</p>	<p>USD 540,000</p>
	<p>Mobilize existing multi-stakeholder platforms at federal levels to enhance intersectoral coordination, with the leadership of MEFCC and in collaboration with other institutions, such as EWCA and MoANR that have also given the mandate to engage on issues related to forestry, such as agroforestry, wildlife conservation, biosphere reserves and watershed management.</p>	<p>USD 250,000</p>
	<p>Establish a forest information management system to develop key performance indicators for the forest sector on which to base regular monitoring. This will allow for conducting periodic forest resource assessment/national forest inventories using international standard methodologies to inform the status of the forest resources to national and international stakeholders. In addition, it is highly important to establish networks of permanent plots in different forest types to monitor and generate relevant parameters related to tree species and forest stands, to inform sustainable forest management planning and collect geo-referenced data on forestry activities (e.g. tree planting).</p>	<p>USD 10,000</p>
	<p>Establish a forest safety division with two well-equipped and prepared branches under MEFCC. MEFCC should also establish a system of forest quarantine as a strategy to safeguard the biological resources of the country against new pests and diseases. Any importation of wood and non-wood forest products need to be carefully checked and monitored by an authorized entity administrated by MEFCC.</p>	<p>USD 4.5 million</p>



Program area	Implementation strategy components	Expected costs
Revising the National GDP accounting system	Revise the national GDP accounting system related to forestry and valuation of the contribution of the forest sector to the national GDP to better recognize the true value of the various products and services offered by the forest sector in Ethiopia.	USD 130,000
Human capacity development	Develop TVET tailored forestry extension agent (DA) training⁸ to have DAs devoted to forest development and processing. Particularly when it is commercial oriented, dedicated and adequately trained forest rangers (extension agents) are needed, not NRM trained extension agents. Forest developers, whether private, public or farm households, should get quality advice and services on various aspects of forest development such as species selection (what to plant), quality seed and seedling production, planting techniques, stand management, harvesting and processing. Entrepreneurial skills training should be provided to forest owners and managers by adequately trained forestry extension agents. Therefore, forest ranger training should be given separate and independent from NRM at TVET colleges.	USD 1.35 million
	Tailor university forestry education to align with sector development needs. New programs should be opened to train experts including in forest industry, from machine-operators up to industry technicians and professionals in wood sciences and wood processing technology. There is the need to integrate forest resource development and forest industry teaching in the same college with some cross-cutting courses.	USD 2.14 million
	Re-institute public forest training centers such as those that used to exist in Menagesha-Suba near Addis Ababa, Merto Lemariam in Gojam to provide continuous technical and managerial capacity building. Forestry agencies of each regional state will administer the centers and be equipped with necessary facilities such as classrooms, laboratories (e.g. nurseries), and human resources. The centers should be located near well-managed forests that can be used for practical training. The centers can offer trainings based on request or can initiate themselves by designing short courses based on need assessments. The centers can have their own permanent staff, or can also invite qualified professionals or consulting firms from inside or abroad to be involved in the training process.	USD 9 million

⁸ A regional survey is currently being conducted to determine the exact amount of expertise that is required. Thus, the target numbers may be further refined.



Program area	Implementation strategy components	Expected costs
Technology development	<p>Improve research capability of EEFRI (or its centers) through modern laboratories and state-of-the-art research facilities, both indoor and outdoor, to guide forest sector development through technology innovation and adaptation to local instances. Some key facilities needed to strengthen the forest research system are:</p> <ul style="list-style-type: none"> • Automated greenhouses, with sufficient open field nearby; • Modern wood and bio-products/chemistry research facilities; • Physiology, nutrition and tree genetics laboratories with modern equipment; • Field plantations and natural forest stands under its jurisdiction for controlled trials and long-term tree improvement programs; • Modern labs for wood-based compo-sites manufacturing and testing; • Biotechnology and tree genetic improvement laboratories; • Identify areas with potential for profitable es-tablishment of tree-based/forestry enterprises, that respond to local demand for forest produce; • Conduct native and exotic tree species/variety trials in target areas to inform the appropriate matching of species and varieties/cultivars to sites; • Conduct research into forest produce markets, processing and production methods to inform guidance to farmers that optimizes profitability; • Introduce site-species-market approach to increase benefits of trees planted in forest landscapes, e.g. woodlots and agroforestry; • Conduct research on pests and diseases to inform the forest safety division; • Establish direct communication between forest managers/farmers, researchers and extension agencies to maximize efficiency and relevance of research in each agro-ecological zone; • Improve research standards for conservation, dendrology and taxonomy. 	USD 6 million
	<p>Develop clonal nursery and greenhouse technology encouraged through public-private partnerships that invest to introduce key forestry technologies related to clonal nurseries.</p>	USD 2.4 million



Program area	Implementation strategy components	Expected costs
Technology development	<p>Establish forest seed orchards around the already established seed centers in 4 regions to improve seed production.</p> <p>Foster public-private partnerships to invest and introduce key forestry technologies e.g. related to clonal nurseries.</p> <p>Develop a system of seed and seedling certification and standardization to avoid the supply of poor quality tree seeds collected by non-professionals, while establishing commercial seedling supply systems.</p> <p>Establish seed orchards for improving the genetic material of promising exotic and indigenous species to improve the genetics over time. Seed orchards including Eucalyptus hedges for producing cuttings are the delivery vehicle for high quality and genetically improved planting materials.</p> <p>For Eucalyptus and other key commercial species (e.g. Pinus, Grevillea and Cupressus) the private sector should be encouraged and supported to set up commercial nurseries.</p>	USD 200,000
	<p>Establish research extension linkage demonstration field sites to make EEFRRI capable of packaging its research innovations in a way that supports effective use and dissemination. The research institute and forestry extension service provider (to be established under MEFC) should work closely to establish a common forum to be held annually such as during research progress and proposals review. Moreover, EEFRRI should have a devoted unit that is actively involved in the dissemination of proven technologies as much as it devotes resources to innovation. EEFRRI should have data/information sharing and repository systems. In addition, EEFRRI should establish demonstration research sites distributed across the country in various agro-ecologies and encompassing the full range of forest types, site productivity and topography.</p>	USD 50,000

The equivalent of USD 4 million in staff time is estimated to be necessary to support this pillar.



Pillar 2: Sustainable forest production and value chains

The sustainable production of trees and forests has the potential to contribute a diversity of products and services generating wealth and well-being for Ethiopia's growing population. Forestry directly contributes to the national economy through employment generation, foreign currency earnings through export, and savings through import substitution. Wood and non-wood products also contribute significantly to other important sectors, including energy, agriculture, food, industry, and tourism to name only a few. This pillar outlines a series of tested approaches for how the forestry sector can enhance its contribution to Ethiopia's economy and productivity. With economic growth and technological advancements, the products and benefits forests provide are refined and thereby made more valuable.

2.1 Establishing new commercial plantations

Investments in forest resource establishment and management are required to ensure Ethiopia can supply its growing demand for timber and wood products with domestically and sustainably produced products. Currently, Ethiopia is importing nearly half of its current industrial wood demand, spending approximately USD 124 million annually from 2007-2015 (See Volume I, Situation Analysis). The demand for wood continues to rise rapidly due to the economic growth, expanding urbanization, construction and infrastructure development. Investments in reviving and establishing new commercial forest plantations are urgently required. Recent studies, including the Forest Sector Review (FSR, 2015), showed that Ethiopia should develop about 310,000 ha of well-managed new commercial forest plantation to satisfy its growing industrial wood demands and substitute imports in the decades to come. The baseline for industrial wood product demand (excluding construction wood) is about 3.2 million m³ (Round Wood Equivalent), and this will grow by over 600% by the year 2040. Currently, only 190,000 ha of poorly managed industrial plantations exist in the country (FSR 2015).

This NFSDP recognizes that for the last decades, across Africa, commercial plantations are best established by the private sector. Ethiopia should put more effort into commercial forest development, especially the production of timber. It is essential to mobilize public investment, the private sector, and domestic and foreign investors in forest resource development through direct or fund investments. The rapidly growing demand for wood products and rising timber prices can make such investment yield stable and make lucrative returns. A recent study has shown that the IRR for investing in well-managed commercial tree plantations in Ethiopia might be well over 20% (IFC, 2016). However, this is far above most international benchmarks for commercial forestry and needs to be risk adjusted. Private investment can also be in the form of joint venture, with public enterprises or community groups. Possible investment options include: small and large scale private forest investments by encouraging domestic and foreign direct investment; organized small-holder farm households based commercial plantation development; public investment (federal and regional governments) and/or a combination of these.



Public investment must continue, while working hard to improve the investment climate of the country to attract private sector investment. In addition to mobilizing private sector investment and promotion of commercial woodlots, state forest enterprises should engage in establishing additional commercial plantations utilizing open areas within their concession areas. This can be partly achieved by joint venture with the private sector.⁹

Smallholder farmers must continue to remain actively involved in tree planting in the form of woodlots, but be better organized and coordinated to contribute to commercial forest resource development. Woodlots represent the bulk of planted forests in Ethiopia today, and contribute significantly to national wood products supply, particularly for the construction and biomass energy sectors. This pillar addresses the organization of smallholders that are already practicing woodlots as outgrower to support large-scale forest plantations targeting commercial markets for wood industry value chains. Tree planting and woodlots for local community use (i.e. livelihoods) is addressed in Pillar 5. In many African countries, such as South Africa and Zimbabwe, outgrower schemes, in most cases with small plantations of 1–3 hectares per head, contribute significantly to the respective country's industrial wood production. In Ethiopia, professionally managed commercial forest enterprises need to be strengthened to provide positive spillover to outgrower in terms of capacity development, technology transfer and market access. However, rural farm households are already very active in tree growing. Therefore, establishing strategically located joint ventures between international forest companies and state forest enterprise will be catalytic to technologically and economically advance successful outgrower development for rural livelihoods development.

In fact, much of the productive and suitable lands for tree/forest growing are already used for productive purposes, particularly by smallholder farmers. Engaging smallholders in forest resource development, whether in the form of outgrower schemes or other forms, is important to help Ethiopia effectively achieve its forest sector development agenda. This requires support for the establishment of forest producer associations or cooperatives, supporting them with quality planting material (germplasm) and to improve their tree/forest management practices and to provide them with access to finance to produce quality timber for industrial production and electricity poles. During implementation, best practice recommendations such as the work recently published by CIFOR should be used.

Industrial plantation development as proposed by this Program requires a series of coordinated actions to optimize forest management for production outcomes. Whether managed by private or public entities, industrial plantation development involves a chain of optimized management including silvicultural operations, starting from land use planning, site selection, selection of the species that matches site and market demand, acquiring quality planting material (seeds and seedlings), appropriate planting and follow up with tending operations and harvesting and processing. Some key actions are described as follows:

⁹ International experiences from China and Korea have been considered and adapted to the Ethiopian context for the purposes of developing this chapter. See separate stand-alone document "International Experiences and Best Practices relevant to NFSDP", July 2016.



1. Providing suitable planting area: The land currently available for commercial forest development in Ethiopia is unclear owing to the lack of land use plans. The starting point for commercial plantation development is to identify, demarcate and make productive conflict-free land available. Activities to find suitable land include:

- Identification of non-forest and underutilized land suitable for commercial plantations based on remote sensing and follow-up on-the-ground verification together with local authorities and land owners.
- Demarcation of areas for intense enrichment planting of highly degraded forests and woodlands and integrating remnant trees in plantations.

Regardless of which activity is undertaken safeguard procedures must be complied with. The land identified must be productive enough to ensure a good return on investment. Past mistakes, such as allocating land not suitable for commercial forest plantations due to poor site conditions, limited market access etc. should be prevented. Related matters should be handled by a dedicated agency, e.g. the Ethiopian Agricultural Investment Land Administration Agency.

2. Species selection/choices: Industrial plantation development aims at high annual production of quality wood. The use of fast growing tree species gives plantation developers a significant head start on their timber investment by cutting time to harvest and earn return. Growth rate and timber quality are important considerations in species choice for plantation developers or investors looking for a return on their investment as quickly as possible. This also helps the industry to source timber domestically at competitive rates as soon as possible. Thereby reducing imports and boosting forest industry development. The tree species selected for plantation development must have already been tested and proven to adapt, grow well and be known on the market for its wood products. A large number of fast growing hard and soft wood exotic species have been introduced to Ethiopia since the late 1960s and their growth performance has already been tested. Indigenous, hardwood and conifer species also should be tested in terms of their silvicultural and timber processing potential. Other exotic tree species should also be tested such as *Paulownia tomentosa* (famous in Asia and Australia, first species trials under planning¹⁰) and teak in Western lowlands. However, it will be most important to study international commercial plantation forestry experience considering a site-species-market approach.

3. Quality seed/seedling supply system: Using high quality seed and seedling for planting improves growth performance and the return on investment. Developing a system to introduce and propagate high quality genetic material – especially for clonal *Eucalyptus* – is, therefore, among the priority actions needed for forests sector development. Seed orchards for proven and promising species should be established to supply quality and standard tree seeds, while commercial nurseries should be established to raise and supply quality seedlings.

¹⁰ Oral communication with Dr. Wubalem Tadesse, Director of EEFRI.



4. Incentive package required to promote forest plantation investment: The peculiarity of forest plantation development investment, i.e. its long gestation period, calls for the provision of special incentive packages to attract investment and sustain forest development initiatives. Plantations are long-term investments with a large proportion of capital expenditure occurring in the first years of the production cycle, and major share of revenue generated only at the time of the final harvest, which in most cases is between 10-20 years. Some important incentives required include:

- Improving the implementation of policy frameworks and legislation to become pro-private sector. Avoid frequent major policy changes as this often translates into increased perception of risks and does not foster a climate of security for investors;
- Provision of land for those that demonstrate investment readiness and progress as stipulated in investment plans;
- Development of infrastructure (e.g. roads, railways, power grid connection) to reduce costs and enable the development of a competitive industry cluster;
- Reducing investment risks by supporting joint ventures in the framework of public private partnerships and offering concessional loans, guarantees and structured investment vehicles where public investors take junior tranches;
- Support the Public-Private sector Dialogue (PPD) forum, where the private sector and Government will meet, discuss and identify constraints, elaborate on policy and practical actions needed to facilitate private sector investment;
- Provide special incentive to organized smallholder communities interested in commercial plantation forestry. Such incentives may include: extension services, free quality seedling provision, subsidize the initial investment cost based on successful establishment, arrangement of outgrower scheme, use of communal lands for the development and the like.
- Support domestic and export market entry of harvested wood products (HWP) and NTFPs through smart subsidies for green technology and research.



2.2 Improved management of existing public plantations

The existing commercial plantation stands – many which are over mature and poorly managed – should be harvested and replanted with productive stocks and managed with improved silviculture in the shortest time possible. There are close to 190,000 ha of industrial forest plantation in Ethiopia. These are supplying most of the domestically produced timber in the country, although of poorer quality. As the genetic material is 100 years old, stands have been coppiced many times and some of the production space is occupied by overmature trees that no one can or wants to utilize. Management is required to increase the stand productivity. It is recommended that the existing stands be harvested and replaced over the coming 10 years. Improved management of existing forest plantation can be achieved through various approaches, including involving the private sector either in the form of a joint venture with government forest enterprises and/or by upgrading the capacity of the public enterprises.

Joint venture on the existing forest plantations could be the most viable option for attracting foreign direct investment in the forest sector. Such partnerships can offer several advantages such as knowhow and technology transfer as well as attract increased financial resources to quickly transform the current poorly managed stands into more productive stands. This would improve efficiency, competitiveness and economic progress in the sector. Bringing in foreign companies is suggested based on the assumption that they will provide improved technologies as well as finance for effective utilization or processing of timber from the current stands, and better knowhow and skill development for the replacement and management of the new stands. However, currently there are limited opportunities for private companies to lease large suitable land for plantation establishment. This is partly due to clear land use plans and lands designated and set aside for forestry development. A promising approach to involve the private sector in the forest sector as quickly as possible is to foster joint venture on existing government-owned forest plantations. This could form the nucleus of commercial forest development in Ethiopia. The enterprise joint venture can be meaningful and expanded with outgrower schemes to encompass nearby smallholder tree growers by providing quality seedlings and technical support on growing, managing and marketing saw logs. To improve the effectiveness of joint ventures, there is a need for guidelines and other policy frameworks that govern it.

Capacity building is required to ensure public enterprises and government forest agencies remain strong in Ethiopia. Public forest enterprises should be empowered with more rights to reinvest major parts of their revenue to develop their capacities to better manage forests including by acquiring new technologies, building their staff capacity and strengthening their operational efficiency including by hiring senior technicians from abroad. The enterprises should develop a long-term institutional capacity development plan. Additional public forest enterprises should be established in the regions where there are no such institutions, particularly in the SNNPR, Gambella and Benishangul as these have considerable potential and also high forest resources today. In addition, the functional scope of the enterprises should be expanded to include commercial utilization of NTFPs. As necessary the enterprises can be re-structured by bench marking best arrangements from progressive countries.



2.3 Improved commercial management of natural high forests

With the current and projected demand for industrial forest products, plantation development can reduce the pressure from the remaining natural forests dramatically. However, sustainable natural forest management (SNFM) can also prevent their degradation and conversion, and contribute to related income generation opportunities in forestry and related value chains. Today natural forests continue to be unsustainably used and products from natural forests are sold on informal markets. The sustainable use of natural forests for environmental services, NTFP and timber production can contribute to the maintenance and restoration of natural forests. First and foremost, SNFM creates economic value by better using scarce land resources. Secondly, it reduces public subsidy for protection of the forests by allowing forest management to pay for itself. Thirdly, it restores ecosystem and productive functions. However, without decent SNFM capacity and law enforcement, there is also the threat that legalizing harvesting in natural forests will increase forest degradation.

The NFSDP aims to demonstrate how public forest enterprise and community based SNFM including silvicultural interventions can be based on approved management plans. Assuming the demonstrations are promising, about a third of the natural high forests could be managed on a sustainable basis for multiple purposes, including for timber. The exact proportion of natural forests to be managed for sustainable utilization needs to be established through a national forest survey, inventory of the existing stock, and identification of areas to be protected for environmental protection purposes and those that can be developed for sustainable forest product supply. As a general recommendation forests under the concession of public forest enterprises and existing PFM schemes can engage in sustainable natural forest management. To make productive use of the natural forest, their functions should be redefined as production forest, conservation forest and watershed protection forest through extensive study. This should continue with the following additional activities:

1. Surveying, mapping and demarcating of biodiversity hotspots and critical ecosystems in natural forest;
2. Amending existing management guidelines (e.g. integrate silviculture including sustainable logging protocols in PFM guidelines) and management agreements for each of the parties mentioned above;
3. Conducting forest inventory to understand current stock;
4. Developing a forest management plan (annual operational plan and 10-year plan);
5. Developing management plan approval procedures;
6. Implementing and monitoring the management plan;
7. Developing performance indicators and measurement means (inspection, monitoring and audit systems) for assessing the demonstrations and approve upscaling; and
8. Developing incentive mechanisms.



2.4 NTFPs development and commercialization program

Sustainable forest and woodland management is required to ensure Ethiopia's natural forest and woodlands continue to provide diverse commercially important NTFPs. The most commercially attractive of the NTFPs are gum and incense, honey and beeswax, forest coffee and bamboo. Gum and incense represent the second most important forest goods in terms of export and foreign currency earning after forest coffee. Ethiopia's vast woodlands hold huge gum and incense producing potential. However, the resource base currently faces a number of challenges and risks such as deforestation, pest infestation, improper tapping, regular fire incidence, overgrazing and low regeneration. Improved management of the resource is needed to sustain production of gum and incense and to enhance their economic contribution. Further, there is considerable room to improve and enhance the economic importance of the NTFPs by improving their production, quality assurance and value added processing. The gum and incense sub-sector is relatively advanced in terms of production organization, transporting, grading, packing and exporting. Yet, compared to other countries such as the Sudan, which is the world's leading Arabic gum producer and trader, Ethiopia holds significant unmet potential to become more competitive and enhance the economic importance of the sub-sector. Producers and traders are not organized and there is no value added processing so far.

Ethiopia, as the birth place of coffee, hosts huge natural forest coffee production potential as NTFPs. Currently, 45% of Ethiopia's total annual coffee production is assumed to come from a natural forest ecosystem from coffee plants grown under the canopy of natural forests, either in an unmodified forest ecosystem (wild forest coffee) or in a slightly modified forest ecosystem called semi-managed forest coffee production. These systems of coffee production have a number of important advantages, producing coffee as a 'natural product'. The production system also preserves the natural genetic pool of the coffee crop. Furthermore this mode of production preserves or conserves the forest ecosystem. Therefore, promoting sustainable production of forest coffee can benefit farmers and the country economically, while protecting the forest ecosystem.

The following are among the priority improvements needed:

- i. **Improving management of natural stands and development through plantation:** Gum and incense producing woodlands lack proper management. The resource is vast and under-exploited but also under heavy pressure from shifting cultivators, fuelwood collectors and charcoal makers. No management plans currently exist. As a priority, woodlands should be surveyed to identify good production sites, mapped and clearly demarcated. Following the mapping and demarcation, management plans should be prepared in collaboration with local communities. The management plan should comprise development interventions (e.g. enrichment planting or restoring), protection measures against uncontrolled fire, pest and disease infestation and over grazing, and sustainable production. Management plans are required regardless of whether the production or management interventions are carried out by public enterprises, private concessions or local community. A



technical guideline has recently been developed for gum and incense woodland management at the national level. This guideline should be reviewed, revised as necessary, translated into local languages and made available for use by the resource managers. Man-made plantations of gum and incense species should also be established to increase efficiency in production and also to serve as in-situ conservation of their genetic material.

- ii. **Improving production technology:** Current production technologies and techniques are inefficient and harmful to the resource base. The traditional practices of wounding stems with sharp knives remains dominant and is highly damaging to the resource. Improved technology should be generated through research or technology transfer from other countries such as India.
- iii. **Cultivate business associations and introduce business standards:** One important gap in gum and incense marketing is the absence of traders associations. Traders/companies act individually, often leading to unsustainable management and business practices. Moreover, the absence of organized actors contributes to the low visibility of the sector. The development of associations can play an important role in making room for the private sector to voice their demands, pool resources, and introduce voluntary sustainability standards to ensure future supply and increased benefits derived from the sustainably managed resources.
- iv. **Support value added processing:** Gum and incense are applied in a wide variety of industrial applications such as in confectionery, food and beverages, cosmetics and pharmaceutical products. Such applications are based on processing and extracting specific ingredients from the raw gum and incense. Separated and refined ingredients fetch higher market prices than in raw form. However, the spatially explicit supply of specific varieties and related industry use of gum and resin resources is often not known. Many countries currently importing raw gum and incense from Ethiopia process, add value, and re-export it all over the world for higher prices. This is lost value for Ethiopia. Adding value to the products at least through partial processing can increase revenue generated for domestic enterprises. With the expansion of the industrial sector in the country, value added processing can also reduce the need to import the goods derived from gum and incense for domestic industries. In other words, value added processing not only increases the export value of the products, but it also reduces imports. The chemistry of the products has already been studied and what is needed is to support the private sector or public companies to introduce the technology.
- v. **Complementing other forest-friendly activities in concessions areas:** Forest coffee and honey from specific forest types fetch high premium if produced sustainably and certified but they will always remain niche products. In addition there are often trade-offs between maximizing production and maintaining the forest and its biodiversity. Therefore, respective niche production should be supported for local livelihoods but protection standards need to be enforced.



The NFSDP will support the realization of Ethiopia's high beekeeping potential. The availability of large areas with flowering plants (forest and outside forest), large bee colonies and seasonal rainfall provide an environment conducive to sustainable, profitable and healthy bee-keeping. The advantage of beekeeping is that it can be easily integrated with forest management activities to add value to land or increase revenue from forest management practices. The dominant beekeeping practice is forest based, which makes it natural and organic. However, production and trade remain poorly organized, value chains are undeveloped, and traditional and often inefficient production systems dominate. Modern and improved beekeeping is not widespread throughout the country. Consequently, yields are very low, and quality is poor. Beekeeping also produces several commercial products other than honey, and one of the prominent products is beeswax. Ethiopia is among the largest producer and exporter of wax. Wax is a product of wide industrial application such as in candle production, skin creams, wood polish and other products. This can also generate considerable additional income. Forest beekeeping should be transformed to raise its environmental and economic benefits. Several interventions are needed in the process of transforming it to modernize and commercialize the forest beekeeping practice. Interventions identified to improve the sector in a priority order are:

- i. Promote producer associations:** Forest beekeeping is a household business today and practiced in a fragmented system. Except for a few cases where government and NGOs attempted to organize producers into associations or cooperatives, the majority of the producers still operate individually. Consequently, production volumes end up being traded on local markets for brewing a local mead called 'tej'. Organizing producers is needed to improve market linkage (domestic and foreign), processing and add value to beekeeping products. Organization also facilitates access to credit, modern equipment and other production supplies as well as provision of extension services. In short it offers greater economies of scale. It will help producers to combine their efforts in order to purchase equipment (e.g. honey processors) and supplies at a discount, facilitate aggregation and process their honey, effectively integrated into a value chain. A priority intervention for the modernization and commercialization of forest beekeeping is, therefore, to organize producers into associations or cooperatives and beyond such as unions at the regional level and a federation on a national scale. In parallel, it is important to increase the visibility of organic and natural honey and wax, e.g. through labeling of organic production standards beginning at the pilot level.
- ii. Improve extension services and access to modern hives:** The major constraints that affect forest-based apiculture are a lack of modern beekeeping knowledge, shortage of trained manpower, reliance on traditional practices and poor extension support to develop the sector. Modernizing the production and marketing of forest beekeeping requires well-facilitated extension services to build beekeeping knowledge and skill, introduce, demonstrate and facilitate the adoption of improved technology (modern hives, honey processor and ancillary equipment) and value chain development.



- iii. **Market linkage and value chain development:** Market orientation and integration is a strong incentive to facilitate modernization and commercialization of forest beekeeping. Both honey and wax should be targeted in value chain development. This will require building business skills and improving quality, packaging and labeling. The fact that beekeeping products, honey and wax, are pure, natural and organic can help producers find niche markets, but this needs promotional work as well. Support is needed to identify such niche markets, improving market information systems and facilitate and establish market linkages until these are functional.

Develop the forest coffee value chain. Forest coffee plays an important role in the Ethiopian economy by generating exports and creating rural jobs. Moreover, management of forest coffee systems promotes the conservation of biodiversity. Forest coffee should be promoted through the following means:

- i. **Strengthen the value chain and assurance process:** Forest coffee commands a ~200% price premium over non-forest coffee (non-forest coffee green beans sell at ~\$1.30 per lb. on ECX, whereas forest coffee green beans could sell at ~\$4-5 per lb.). However, buyers will only pay a price premium if they are reasonably assured that the coffee is truly forest coffee.
- ii. **Increase extension services to improve quality:** Significant volumes of coffee are lost or damaged annually due to poor post-harvest practices. Extension services should include the promotion of production/protection standards.

These initiatives should be undertaken in collaboration with existing projects (e.g. Partnership for Forests) and build on lessons from past projects (e.g. NTFP-PFM research & development project) and successful sustainable coffee ventures in Ethiopia (e.g. Moyee Coffee). Close col-laboration or a joint action of all government ministries and organizations mandated on the coffee value chain is vital as all have expertise to contribute and a stake in maximizing the value from forest coffee. Key partners include the Coffee and Tea Marketing Agency of Ethiopia, MoANR, and ECX.



2.5 Improved management of highland and lowland bamboo resources

Ethiopia's estimated 520,000 ha of highland bamboo forest require management to reverse the trends of degradation, forest fire and unsustainable utilization practices. Ethiopia's bamboo resources have the potential to attract public and private investment for industrial use. However, bamboo utilization has remained undeveloped and current bamboo value chains are used predominantly for traditional applications such as house construction, fencing and small cottage furniture manufacturing. Industrial uses of bamboo can be made to produce various high value products such as ply bamboo, laminated bamboo, bamboo parquets/floors, bamboo composite boards, bamboo chipboard and various other laminated bamboo wares and pulp and paper. Industrial bamboo processing has been recently initiated such as the Adal Industrial PLC, Africa Bamboo PLC and Mirga Wood Industry. Given the large resource base and potential to grow more bamboo forest in the country, the few experiences from its recent industrial use can be expanded to contribute to the growing domestic demand for wood products.

Implementation strategy: To improve the management and utilization of bamboo resource sustainably a number of interventions are needed. The priority interventions are:

- i. Surveying, mapping and generation of reliable information on bamboo resource:** Inventory and mapping of the exact extent of the resource is crucial for industrial level utilization. Available information on the extent (area coverage and standing stock, annual production, etc.) of the bamboo resource is inconsistent and differs widely. Mapping and taking inventory to generate reliable data that can be provided for industry developers is thus essential. Based on the result of the inventory and understanding of the current stock, a sustainable development and industrial utilization plan should then be devised.
- ii. Encouraging demonstration bamboo plantations by smallholder farmers for commercial purposes.** Areas where bamboo (highland and lowland) can be planted for commercial use need to be identified/mapped and smallholders need to be trained and supported to establish bamboo plantations including in the form of an outgrower model. Given the limited experience, demonstration plantations should be supported.
- iii. Promoting bamboo industry development and value chains:** Bamboo can be industrially processed. The potential variety of commercial products include: flooring, laminated furniture, building panels (similar to timber-based plywood, chipboard or MDF), high quality yarn and fabrics, and pulp and paper. Developing the various commercial product value chains and linking these to markets is needed. The activities to develop the industry are similar to commercial plantation forestry (see Chapter 3.1).
- iv. Strengthening management of bamboo resource:** The development of the resource base should be improved by promoting various management options and investment opportunities similar to commercial plantation forests. Promising examples already exist in Benishangul Gumuz regional state.



2.6 Forest industry cluster development

The projected increasing demand for forest products not only calls for resource base development, but also the establishment of well-functioning, coordinated and competitive wood processing industries. Sawmills, wood-based panel factories, finger jointing lines, pole treating plants, logistic providers, furniture and joinery factories, pulp and paper mills and paper production plants are all needed to meet the growing demands for the various wood-based products from domestic sources. The country can only produce internationally competitive products and replace imports if these various factories, raw material supply systems, logistics and other associated service providers function in an integrated and efficient manner. Currently, existing forest based industries are scattered and lack sufficient resource supply. There is no inter-industry linkage, as industries are often not strategically located with respect to the distribution of the forest resource base. This leads to significant waste of wood products such as off-cuts and sawdust, which could be effectively utilized if the industries were clustered and integrated.

Ethiopia needs to develop globally competitive and effective forestry industries, and this is possible by adopting an industry cluster approach. Clustering or regional agglomeration of industries means building a concentrated system of interrelated business, raw material (input) supplies, processing factories and logistics service providers. Having these in the same location will significantly increase efficiency, reduce wastage and overall cost of production, thus increasing competitiveness. As forest industrialization is in its infancy, the country can benefit considerably from an industry cluster development approach. Forest industry clusters should be developed in consideration of land use planning and suitable forest resources distribution (sources of raw material), potential market, infrastructure availability and work force availability. The concept of agribusiness industry zones should be considered in the design. Where appropriate, forest industry clusters should be affiliated with the industry parks/zones established across the country. Forest industry investment clusters should be developed, each covering an average of 30,000 to 50,000 hectares of high quality plantations within an industry-sourcing radius of around 50 km². Industrial investments (including upgrading) of 12 sawmills (50,000 m³ output each) including kiln drying facilities and 3 panel plants (200,000 m³ output each) including molding and finger joint processing and 30 pole treatment plants should be developed in line with plantation development and available feed supply.

Forestry industry clusters may be promoted further through two sub-strategies:

- i. **Sub-sector focus:** A sub-sector approach involves providing a package of incentives to potential investors in a well-defined specific sub-sector such as sawn wood and panel production, without confining them to one geographical region. This avoids the prior investment in setting up zones (infrastructure, etc.) but fails to achieve the synergy in having clustered companies in one geographical location.



- ii. **Flagship approach:** A flagship approach involves the government defining a few (typically 3-5) projects with specific land allocated with a specified location for processing. These “flagship” projects should be immediate, large-scale, and high-impact investments. The flagship approach differs from both the industry cluster or sub-sector approaches, in that flagships do not have to be clustered in one geographic area or sub-sector. In fact, they may span a range of regions and sub-sectors to serve as demonstration projects showing the success of manufacturing a variety of products. While this approach can serve as a “proof of concept” and model for further investment, one drawback is that it is less effective at attracting relatively small companies to invest in the sector.

A dedicated professional FDI attraction agency/unit can be used to attract investment, regardless of the set-up of clusters, SEZs and other incentive packages. The unit can provide image-building, investor generation, investor facilitation, policy advice and advocacy services for a country. Possible locations for this facility are as part of the CRGE facility, which is planning to set up a PPP window, and as part of the MEFCO future engagement. A systematic process needs to be followed to identify and develop investments. Steps include:

- i. **Identify and prioritize companies** — Understand target segments of companies for each project (e.g. sawn wood, bio-pallets and bio-economy products), develop first-cut list of potential players (focus on appropriate size and experiences in region using company profiles and filter of set criteria), and identify internal contacts.
- ii. **Outreach, engage, and promote to investors** — Develop an investor pitch pack, send out first wave of outreach letters/emails to prioritized names, conduct first meetings with investors (organize site visits with proper maps) and enforce disciplined updating of investor outreach list.
- iii. **Problem-solve on enablers** — Organize an industry round table to network, raise awareness, identify key bottlenecks and formulate a plan to address these, engage key stakeholders and talk to experts.
- iv. **Refine value proposition and attract investment** — Revise investor pitch pack based on feedback from discussions, tailor value proposition of forest industry to suit and attract prospective investors or anchor tenants, develop creative incentive structures and sign contract with initial investors.
- v. **Repeat outreach, problem solve and refinement of concept** — Re-engage potential investors regularly, provide update emails after each engagement to install confidence in progress, and follow up assiduously on promised action items to build credibility.

In addition, 200,000 rural and urban housing units (new construction and modernization) should be developed using modern timber products and design to sequester greenhouse gas emissions in long-lived harvested wood products (HWP) and to substitute emission intensive products such as cement and steel.



1. **The forest sector contributes to climate mitigation not only through reforestation and sustainable forest management, but harvested wood products (HWP) further extend the storage of this sequestered carbon until the end of their product life cycle.** The positive properties in particular of long-lived forest products as a renewable resource provide efficient and low-carbon alternatives compared to many other materials. With Ethiopia's construction sector booming, there is huge potential for Ethiopia to replace energy intensive materials, such as concrete and steel, with sustainable domestically produced timber and wood products. Three key policies will affect future consumption of harvested wood products: CRGE green growth strategy¹¹ aims to reestablish the commercial forestry sector and introduce energy-efficient technologies in industries and buildings.
2. National housing programs¹² will be a main driver of wood demand for structural timber and auxiliary uses, such as casing or scaffolding. Indirectly there will be a positive impact on wood consumption for furniture.
3. Rural electrification¹³, which is part of the general CRGE strategy, will result in an increased consumption of utility poles.

11 Ethiopia's Climate-Resilient Green Economy (CRGE) strategy (2011) follows a sectoral approach and has so far identified and prioritized more than 60 initiatives, which could help the country achieve its development goals while limiting GHG emissions. The green economy plan is based on four pillars: (1) Improving crop and livestock production practices for higher food security and farmer income while reducing emissions; (2) Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks; (3) Expanding electricity generation from renewable sources of energy for domestic and regional markets; and (4) Leapfrogging to modern and energy-efficient technologies in transport, industrial sectors, and buildings.

12 The Integrated Housing Development Program (IHDP), 2006/7-2009/10 had initially set an ambitious goal of constructing 396,000 housing units, but was only able to deliver 142,802 due to a lack of adequate financing from the National Bank of Ethiopia. Housing is a key focus within the GTP/ECR-3G2P context with several new sub-programs and financing mechanisms established. Since the GTP started, a total of 96,233 housing units and 1,720 housing blocks have been constructed. Amongst others one severe threat to achieving the ambitious Ethiopian tasks in housing development is the lack of construction materials, i.e. with regard to timber. In addition the massive construction plans result in GHG emissions (if non-renewable materials are used) that pose a threat to the achievement of the Ethiopian INDC submission.

13 With a strong focus on renewable energies, the Ethiopian government is planning to proceed rapidly with providing grid access to +50% of the rural and 100% of the urban population by 2025 (IFC Lighting Report, 2011). This will have an influence on fuelwood consumption, but also the use of industrial round wood is expected to increase significantly due to electricity poles being needed all over the country.



Table 2: Pillar 2 Action program areas and implementation strategies

Program area	Implementation strategy components	Costs and benefits in NPV
Establishing new commercial plantations	<p>Develop private commercial forest plantations to establish and manage commercial plantations in strategically located industry clusters following strict guidelines on social and environmental safeguards. It is envisaged that at least 50,000 ha, which is about 17% of the total commercial forest plantation needed in Ethiopia, should be developed by private commercial forest enterprises. This means, at least 5,000 ha plantation forest establishment per year over the coming 10 years to ensure a sustainable supply of timber products. Private investment should be coordinated in terms of geographic location, species choice and management objectives to increase relevance and avoid fragmentation of operations.</p>	<p>USD 60.0 million in labor costs and USD 33.1 million in materials. USD 209.2 million in revenues, USD 40.0 million in carbon benefits, and USD 19.9 million in soil erosion reduction benefits.</p>
	<p>Develop commercial forest plantations by state enterprises to establish 150,000 ha, which is 33% of the whole new plantation development needed for the country. This will require establishing about 5,000 ha annually to ensure sustainable flow of wood products.</p>	<p>USD 180 million in labor costs and USD 99.3 million in materials. USD 627.7 million in revenues, USD 119.9 million in carbon benefits, and USD 59.7 million in soil erosion reduction benefits.</p>
	<p>Organize smallholder's commercial plantation/ woodlots to transform at least 150,000 ha of existing woodlots and develop a smallholder commercial forest plantation in the vicinities of forest industry clusters and close to commercial forest enterprises. This means at least 15,000 ha of the woodlots should be transformed each year over the coming 10 years. The remaining woodlots, which cover approximately 450,000 ha, should also be supported with improved forest extension services to provide wood products partly for industrial purposes but mainly to satisfy local wood products demand as described in NFSDP Pillar 5.</p>	<p>USD 176.4 million in labor costs and USD 97.3 million in materials. USD 615.0 million in revenues, USD 117.5 million in carbon benefits, and USD 58.5 million in soil erosion reduction benefits.</p>
Improved management of existing public industrial plantations	<p>Establish joint venture (PPP) to improve management in 70,000 ha of the existing industrial plantation estate to be transferred and managed jointly. Based on initial experiences and lessons learnt, additional plantation estates can be transferred to joint venture model of management.</p>	<p>USD 9.6 million in labor costs and USD 2.2 million in materials costs. USD 25.5 million in revenues, USD 37.3 million in carbon benefits, and USD 13.7 million in soil erosion reduction benefits.</p>
	<p>Improve forest management through public forest enterprises, approximately half of the current industrial plantation, which is 110,000 ha, should be managed by and remain with public forest institutions.</p>	<p>USD 12.2 million in labor costs and USD 2.7 million in materials costs. USD 32.4 million in revenues, USD 47.4 million in carbon benefits, and USD 17.3 million in soil erosion reduction benefits.</p>



Program area	Implementation strategy components	Costs and benefits in NPV
Improved commercial management of natural high forests	Improve management of PFM forests designated as production forests , with 200,000 ha public enterprise and PFM based SNFM is demonstrated for the first 5 years of the program period. Assuming the subsequent comprehensive assessment reveals positive results in terms of forest condition and rural livelihoods it benefits at least 1.3 million ha of additional natural high forests, i.e. a total of 1.5 million ha over the 10-year period, should be prepared for sustainable natural forest management.	USD 45 million in labor and materials costs. USD 107.2 million in revenues, USD 34.2 million in NTFPs, USD 156.8 million in carbon benefits, and USD 57.5 million in soil erosion reduction benefits.
	Improve management through public forest enterprises , with 100,000 ha allocated for the SNFM demonstration and assuming a successful demonstration 0.75 million ha natural forest assigned for SNFM, i.e. half of the total proposed production natural forest to be managed through public enterprises.	
NTFPs development and commercialization	Develop value chain of 3 NTFP (gum and resin, honey and beeswax, forest coffee) to enhance the production and utilization of the various NTFPs by properly surveying, mapping and understanding the resource base and their potentials for commercial utilization; improving their utilization through modernization and commercialization; developing their value chains by cultivating business associations (producer and traders associations); supporting value added processing and increasing private sector investment. For each the value added along the domestic value chain compared to the baseline is increased by at least 20% within 10 years.	USD 225,000 in labor and workshop costs.
Improved management of highland and lowland bamboo resources	Sustainably manage bamboo resources and develop value chain through mapping, demarcation, improved management and use of about 300,000 ha of bamboo; of which 100,000 ha is highland bamboo and 200,000 ha is lowland bamboo.	USD 42.2 million in labor costs and USD 9.4 million in material costs. USD 111.9 million in increased revenues, USD 163.6 million in carbon benefits, and USD 59.9 million in soil erosion reduction benefits.
	Establish new bamboo plantations: 100,000 ha new plantation establishment both for the highland and lowland in the vicinity of bamboo industry cluster. The plantation could also be promoted as bamboo outgrower scheme with smallholder farmers.	USD 119.0 million in labor costs and USD 65.6 million in materials. USD 414.8 million in revenues, USD 79.3 million in carbon benefits, and USD 39.5 million in soil erosion reduction benefits.



Program area	Implementation strategy components	Costs and benefits in NPV
Forest industry cluster development	Establish wood industry clusters , one in the north and another in the south of the country to also include NTFP industries. Around each forest industry cluster, also support the development of numerous small and medium wood processing industries in industrial zones. The remaining two industry clusters will be established in GTP 3.	USD 1,121.3 million for construction of industry clusters. USD 3,313.8 million in revenues.
	Promote modern timber products and the use of harvested wood products to store carbon and substitute emission intensive products through investments in modern state-of-the-art wood processing industries. This includes high quality saw mills, kiln drying facilities, panel plants, molding and finger joint processing, and pole treatment plants. Further, it will be important to provide technical assistance to local entrepreneurs, and enable joint ventures of local entrepreneurs with companies from countries with advanced industrial forestry sectors (e.g. Germany, China, and South Africa).	USD 77.2 million in grant payments to wood processing businesses.

In addition to the specific investments listed above, the pillar is expected to require the equivalent of approximately USD 462.0 million in staff time for management. Table 3 presents the per hectare cost and benefits of selected Pillar 2 activities.

Table 3: Pillar 2 activities’ per hectare costs and benefits

	Costs	Fuel-wood revenues	Round wood revenues	NTFPs revenues	Carbon benefits	Soil erosion benefits	Employment
Plantation establishment	2,501	1,548	4,071	0	1,073	535	0.1
Improved plantation management	235	290	218	0	743	272	0.1
Improved natural high forests management	30	58	44	32	149	54	0.01
Improved bamboo management	235	290	218	0	743	272	0.1
Bamboo establishment	2,501	1,548	4,071	0	1,073	535	0.1

Plantation establishment and bamboo plantation establishment have the greatest costs at USD 2,501 per hectare, but also generate the greatest benefits, primarily through round wood production (Table 4). Improved management of natural high forests has the lowest per hectare costs because they are relative low input; as a result they create the fewest full time jobs per hectare.



Table 4: Current and projected industrial wood demand in Ethiopia by product type excluding construction wood need

Product type	Demand in RWE (m ³) by period	
	2015	2040
Sawn wood	633,000	2,200,000
Plywood	11,700	715,000
Veneer and particle board	91,700	88,500
MDF	12,000	375,000
Furniture	69,996	7,699,560
Utility poles	40,000	500,000
Pulp	5,500	20,000
Paper and paper board	357,590	2,383,900
Total	1,221,486	13,981,960

Pillar 3: Forest environmental functions

As Ethiopia continues to experience rapid economic growth, the role of the forest sector becomes increasingly important in achieving the government’s ambitious Climate-Resilient Green Economy (CRGE) growth goals, which aim for Ethiopia to become a middle-income country by 2025, resilient to climate change impacts and with a zero net increase in greenhouse gas (GHG) emissions over 2010 levels. Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks, is one of the four main CRGE pillars. Building the CRGE forestry targets, the strategic recommendations proposed in this NFSDP can significantly advance the sector towards one that better contributes to Ethiopia’s environmental sustainability and equitable socio-economic development.

Forest values related to ecosystem services, such as watershed protection and associated benefits related to energy and soil protection, ecotourism potential and biodiversity conservation, contribute significantly to the health and wealth of Ethiopia. Moving forward, future studies can help to better understand the full range of economic and non-economic values of Ethiopia’s forests, including their role in poverty reduction, to continue providing policymakers with important information regarding Ethiopia’s forest sector development.



3.1 Forest ecosystem services

In addition to the diverse wood and non-wood products described in Pillar 2 relating to sustainable forest production and value chains, Ethiopia’s forested landscapes provide a wide range of environmental services benefitting both local forest communities and the global public. The ecological services include biodiversity conservation, climate change adaptation and mitigation, watershed protection services, and livelihoods for local communities. Payments for environmental services (PES) schemes create an economic value for these services that are otherwise often used freely. The aim of PES is to use markets to ensure the sustainable management of forests and their conservation into the future. The main PES schemes considered in this NFSDP are climate and water regulation and biodiversity.¹⁴ However, a range of other important forest environmental services may provide an opportunity to develop sub-national PES programs. These include¹⁵:

- Biodiversity;
- Watershed protection;
- Soil protection and fertility enhancement; and
- Ecotourism (recreation value of forests), e.g. hotels or tourism facilities using forest sites could provide payments.

As the national study “Assessing forest-based PES opportunities in Ethiopia” is finalized, the recommendations from this study should be piloted to draw lessons for scaling up. International experiences from Costa Rica and Vietnam have been adapted to the Ethiopian context for the purposes of developing this component.¹⁶ Costa Rica’s PES program is one of the leading examples of a successful national PES program which is supported by forest law. The forest law established the PES scheme through offering payments for reforestation and forest conservation.

In terms of climate mitigation, Ethiopia has the ambitious plan to not only achieve substantial economic growth, but simultaneously to become carbon neutral by 2030. Deforestation and land use change in Ethiopia have been recognized for contributing substantially to national GHG emissions. The majority of deforestation is caused by forces outside the forest sector, such as agriculture or infrastructure development. Therefore, REDD+ is taking a cross-sectoral approach where the development objectives of multiple sectors must be integrated into a comprehensive program.

¹⁴ These have been confirmed by the ongoing study “Assessing forest-based PES opportunities in Ethiopia” (Draft Interim Report, 2016).

¹⁵ Providing price premiums for NTFPs that have been certified for sustainability (example from biodiversity certified coffee) has been covered in Chapter 3.

¹⁶ See separate stand-alone document “International Experiences and Best Practices relevant to NFSDP”, July 2016.



At the same time, there is significant potential for Ethiopia to reach its climate mitigation goals not only by avoiding deforestation but also by establishing forests and improving the sustainability of forest management. Trees capture and store carbon as they grow and a sound forest management strategy that takes into consideration these climate benefits can play an important role in helping Ethiopia reach the ambitious national climate mitigation goals while increasing the economic benefits derived from forests and trees.

Due to the importance of forests in not only avoiding GHG emissions but also in sequestering and storing carbon from the atmosphere, the forest sector is considered a key pillar of the CRGE strategy (FDRE 2011). To ensure the forest sector contributes to Ethiopia's climate mitigation objectives, the country is currently developing a national REDD+ strategy as well as sub-national programs to implement REDD+. Given the diversity of forests in Ethiopia, climate mitigation in the forest sector will be implemented in different ways, depending on the local context and local priorities.

In the context of REDD+, Ethiopia is already a front-runner participant in the BioCarbon Fund. With regards to this the regional state of Oromia is developing a large-scale jurisdictional REDD+ program to benefit from performance-based payments at the regional level. Similar jurisdictional programs are planned to be scaled out in a number of other regions. The majority of REDD+ finance currently stems from the World Bank's Forest Carbon Partnership Facility (FCPF) to support Readiness. The FCPF Carbon Fund will also provide results-based payments once Ethiopia has reached the third "performance-based payments" phase of REDD+. In the interim, Ethiopia must identify new and additional sources of finance in order to fill the fi-nance gap to support the second "investment" phase of REDD+.

The national REDD+ strategies aim to achieve the following:

- Improve the enabling environment including institutions and governance systems, as well as spatial planning for forest land demarcation and initiating regional REDD+ design across regions while implementing REDD+ interventions in few regional states. Much progress in readiness has already been achieved, but requires continuous improvement. The enabling environment aspects related both to REDD+ and the NFSDP have been addressed in Pillar 1: "Enabling Environment and Institutional Development."
- Address the drivers of deforestation and forest degradation to achieve 20% of 130 MtCO₂e (26 MtCO₂e) of Ethiopia's emissions reduction plan in the first five years.
- From 2016-2025, expand on-ground REDD+ interventions across regional states while putting in place enabling environments nationally and regionally. These interventions will bring about up to 65% of Ethiopia's emissions reduction plan by 2030.
- Advance Oromia Forested Landscape Program to implementation phase to allow for performance-based emission reduction payments by 2020 or earlier if verifiable emission reductions are produced.



In terms of watershed protection, a recent review of global PES schemes applied to the case of forests in Ethiopia proposes that one of the services most suitable for PES is the water quality regulation service.¹⁷ This is because forests play an important role in reducing the rates of soil erosion and landslides, resulting in a reduction of sediment runoff into watercourses and hydroelectric dams. Setting up this PES scheme will require collaboration with the Ministry of Water, Irrigation and Electricity and mapping and assessment of high forests and woodlands of high importance to watersheds. It is important to note that the protected areas and biosphere reserves considered under Forest Biodiversity Conservation Program Areas also serve water-shed protection purposes.

3.2 Forest biodiversity conservation

Forest is the major source of biodiversity and ecosystem services on which Ethiopian economy is based. Ethiopia is one of the top 25 biodiversity-rich countries in the world. The forests are found across the majority of the ecosystems of the country and there are 58 National Forest Priority Areas (NFPAs). Further, the church forests of the Ethiopian Orthodox Church and other sacred or respected forest areas are also key areas where natural forest biodiversity is found. The majority of the NFPAs are heavily deforested and fragmented as a result of forest clearance and land use conversion for smallholder agricultural expansion, promotion of large-scale commercial and state development investments in forest frontiers, illegal extraction and collection of forest products, government-led human resettlement in forest areas, forest fires and increasing development of infrastructure and road networks in forest proximities. Thus, deforestation and forest degradation are threatening Ethiopian forest biodiversity and ecosystem services.

The Protected Areas (PAs) in Ethiopia are neither proportionally large enough related to the country's land mass nor are the existing PAs representative of the country's ecosystems. Most existing PAs were established in a limited range of altitude in semi-arid ecosystems. Only some of the NFPAs and PAs have been inventoried, demarcated and legally gazetted, and few have management plans. Therefore, there is urgent need to assess NFPAs, PAs and biosphere reserves for proper management and legal protection. In parallel, the NFSDP must ensure the effective conservation and sustainable use of the PAs, biosphere reserves and NFPAs through effective Watershed Protection and devising Payment for Ecosystem Services (PES) schemes.

The following actions are proposed for effective forest biodiversity conservation in Protected Areas, Biosphere Reserves and National Forest Priority Areas:

- Improving management of high forests and woodlands through demarcation, community awareness creation and strengthening law enforcement;
- Scaling up PFM to all NFPAs, biosphere reserves and protected areas;

¹⁷ 2016, GGGI: "Assessment of forest-based PES Opportunities in Ethiopia." Draft Interim Report.



- Based on experiences from Korea designating military forests and protected areas in lowlands and remote areas where there is very sparse population;
- Establishing ten new PAs that are ecologically representative through gap analysis of existing PAs and propose new PAs;
- Draft legal instruments, gazetting, legalization and putting institutional instruments in place to have institutionalization and proper management of all PAs;
- Finalize national strategy for biosphere reserves (housed in Ministry of Science and Technology);
- Ensure implementation of the biosphere reserve strategy by developing or revising management plans for each biosphere reserve based on this strategy;
- Increase biosphere reserves from four to eight, while ensuring their sustainable management;
- Source new and additional funding sources for PA management, including for example, preparation of a nomination document and apply for United Nations Education, Scientific, and Cultural Organization (UNESCO).

It aims to increase the extent of protected area from 14% to 22% by establishing new ecologically representative areas. Note that 70% of the NFPA and high woodlands will be designated for watershed and biodiversity protection function and managed under PFM.

In order to better ensure the maintenance of forest biodiversity into the future, it is important to develop strategies for the sustainable use of biodiversity. Allowing local populations to benefit from the biodiversity in their ecosystems creates further value for biodiversity, thereby engaging communities in the protection of biodiversity.

Specific actions: The following specific actions are proposed to ensure the forest biodiversity sustainable use program:

- Promote NTFP marketing and certification;
- Promote sustainable tourism;
- Enhance bio-prospecting research;
- Conduct biodiversity valuation;
- Enhance *ex-situ* conservation and utilization of genetic resources;
- Conserve indigenous knowledge by documenting this knowledge (including in woodland areas);
- Replicate biodiversity areas at risk, e.g. *Boswellia* woodlands;
- Facilitate sharing of indigenous knowledge, thereby supporting transfer of this knowledge to the next generation.



There are three botanical gardens which are at a very early stage to serve conservation, research, education and aesthetic purposes. There is a need for the establishment of several botanical gardens to conserve important biodiversity. This component has an important link with the urban greening chapter, as establishing botanical gardens also meets the educational and recreational needs of society in and around urban areas. A Botanical Gardens action program will be implemented by establishing seven new Botanical Gardens in addition to the existing three. These will need to be managed in an efficient way, including by developing an awareness raising strategy for the urban population. There will be upscaling of experiences. Awareness raising will also be conducted on the needs, management and enhancement of botanical gardens to put into action the ultimate goals of the gardens. An awareness raising strategy should be developed in parallel. Relevant activities here include organizing public lectures on the botanical gardens grounds, and developing programs for environmental events (e.g. forest, biodiversity, environment, and earth and water day celebrations).

3.3 Forest landscape restoration

Land and forest degradation is a severe problem in Ethiopia, causing low agricultural productivity, food insecurity, and rural poverty. Estimates suggest 45% of the total Ethiopian land mass has been affected by soil erosion of arable land (Lakew 2000). As the impacts of natural resource degradation on the economy and people's livelihoods are significant, complex, and amplifying with increasing climate risks, efforts to restore degraded lands have regained momentum in recent years. Forest Landscape Restoration (FLR) is the integration of forest restoration activities into a landscape with multiple sustainably managed land uses that support local livelihoods. This situation has been reversed in some parts of the country (e.g. Humbo Woreda in SNNPR and Tigray, where over 224,000 hectares of land have been restored). This demonstrates that recovery of vegetation in dryland areas can be very fast. However, efforts so far have been constrained to local water-sheds and efforts to scale up restoration and sustainable land management (SLM) on a large scale have been initiated by programs such as the Sustainable Land Management Program (SLMP 1 and 2).

In September 2014, Ethiopia declared their support for the New York Declaration on Forests and the Bonn Challenge by pledging to restore 15 million hectares of degraded and deforested lands by 2025 (corresponding to nearly one seventh of Ethiopia's total area). This could amount to emission reductions of 1.42 GtCO₂ – nearly 5 times more than Ethiopia's Intended Nationally Determined Contributions (INDC) pledged emission reductions. The Atlas of Forest Landscape Restoration Opportunities developed by the Global Partnership on Forest Landscape Restoration (GPFLR), shows that there are substantial opportunities for FLR in Ethiopia. This map is being further refined through an ongoing FLR mapping exercise carried out by MEFCC with support from the World Resources Institute (WRI). Given Ethiopia's moderate to high population pressure, most of the identified opportunities are for mosaic restoration, which aim to integrate FLR processes into pre-existing land uses such as agriculture. The strategy to restore forest landscapes on a large scale requires a coordinated approach across multiple sectors and components of the NFSDP.



Table 5: Pillar 3 Action program areas and implementation strategies

Program area	Implementation strategy components	CBA (in NPV)
<p>Forest Ecosystem Services</p>	<p>Climate change mitigation (emission reduction through REDD+ and AR programs)¹⁸:</p> <p>1. Implement the national REDD+ strategy which lays out the diversity of policies and measures that Ethiopia is planning to take in order to implement REDD+.¹⁹ REDD+ includes five activities:</p> <ol style="list-style-type: none"> 1. Avoiding deforestation 2. Avoiding forest degradation 3. Sustainable forest management 4. Conservation 5. Enhancing forest carbon stock through afforestation and reforestation. <p>2. Consider new approaches to implement REDD+ and thereby benefit from international climate finance.</p>	<p>REDD+ activities partially overlap with activities from other pillars. In order to avoid double counting, costs and benefits are estimated for participatory forest management, afforestation/reforestation, the distribution of cookstoves, and climate-smart agriculture:</p> <ul style="list-style-type: none"> • Participatory forest management on 23,750,000 hectares would cost USD 550.2 million and generate USD 1.8 billion in sales of fuelwood and roundwood, USD 576.4 million in sales of NTFPs, USD 2.7 billion in carbon benefits and USD 967.4 million in soil erosion reduction benefits. • Afforestation/reforestation of 3,000,000 hectares would cost USD 971.7 million and generate USD 498.2 million in sales of fuelwood, roundwood, and NTFPs, USD 593.0 million in carbon benefits and USD 165.4 million in soil erosion reduction benefits. • Distribution of more than 17 million cookstoves would cost USD 1.5 billion and generate USD 6.2 billion in sales and cost savings and a further USD 394.2 million in carbon benefits. • Climate-smart agriculture on 1 million hectares of degraded land would cost USD 3.1 billion and generate USD 6.9 billion in revenues, USD 144.3 million in carbon benefits, and USD 52.6 million in soil erosion reduction benefits.

¹⁸ REDD+ activities leading to the planned emission reductions:

1. Implementation of PFM
2. AR on 3 million hectares as indicated in the CRGE
3. Sustainable Management of forests (4 million hectares of high forests and woodlands)
4. Distribution of cook stoves (note this overlaps with rural livelihoods pillar)
5. Climate smart agriculture

¹⁹ FDRE MEFC, National REDD+ Secretariat. National REDD+ Strategy (2016-2030). Final Draft June 2016.



Program area	Implementation strategy components	CBA (in NPV)
Forest Ecosystem Services	<p>Watershed protection program (water based PES Schemes):</p> <ul style="list-style-type: none"> • Mapping and designating of national forest priority areas and woodlands of high importance for watershed protection and assessing the extent to which these are degraded and under threat of future degradation. • Developing a proper management plan for the NFPAs and woodlands of high importance to watershed protection. • Establishing water catchment and river basin based payments for ecosystem services program (water user groups, fisheries, hydroelectric dams, irrigation schemes, breweries and water bottling companies). 	This activity is estimated to cost USD 600,000.
Forest Biodiversity Conservation Development	<p>Forest protected areas/Biosphere reserves development expand PA network through mass mobilization, scaling up of the best practices and existing interventions where proven to work.</p> <p>The aim is to increase the coverage of PAs from 14% to 20% by the year 2025.²⁰ This would require establishing ten PAs and four Biosphere Reserves.</p>	This activity would cost an estimated USD 6.5 million to establish the Priority areas, Biosphere Reserves, and Protected Areas.
	<p>Management and establishment of NFPA, Protected areas and biosphere reserves to improve PA network management, which is considered more important than creating new protected areas. This can be achieved through improved law enforcement, building of infrastructure required for management, and mobilizing the re-sources required.</p>	This activity is estimated to cost USD 1 million.
	<p>Establish botanical gardens to enhance ex-situ conservation: Biodiversity should be conserved by enhancing ex-situ through botanic garden establishment. Botanical gardens have four functions: Conservation, research, educational and aesthetic value. Therefore, it is also considered under the urban greening pillar.</p>	The establishment of botanical gardens would cost an estimated USD 16.8 million in net present value terms.
Forest Landscape Restoration	<p>Forest Landscape Restoration:</p> <ul style="list-style-type: none"> • Identify priority areas for restoration and develop feasible restoration intervention types for the specific area; • Quantify the stakeholders that will need to be mobilized to realize restoration, assess the costs and benefits of each restoration type; • Analyze the finance and investment options for restoration in the assessment area, including sources of finance. 	Restoration of 15 million ha would cost an estimated USD 1,165.5 million. This investment would generate USD 2,279.8 million in revenues, USD 2,225.9 million in carbon benefits, and USD 845.2 million in soil erosion reduction benefits.

Staff time for this pillar is estimated to be equivalent to USD 1.2 billion. Table 6 presents the per hectare costs and benefits of this pillar on a per hectare basis.

²⁰ The NBSAP target is 20% by 2020. Increasing this further is not realistic nor necessarily necessary for in-situ conservation.



Table 6: Per hectare costs and benefits of activities²¹

	Costs	Fuel-wood	Round wood	NTFPs	Grain revenues	Carbon benefits	Soil erosion benefits
PFM	30	58	44	32	0	149	54
A/R	447	20	24	185	0	273	76
Climate-smart agriculture	4,072	0	0	0	8,932	187	68
FLR	87	20	0	185	0	200	76

Climate-smart agriculture is notable for having the greatest per hectare costs. However, the majority of these costs are in the form of in-kind labor contributions from smallholders. Small-holders are rewarded for their labor in the form of dramatically increased grain revenues. Depending on the smallholder, increased revenues may also result from NTFP production, fuel-wood savings, or other sources. It is important to note that climate-smart agriculture is assumed to take place in degraded landscapes, especially buffer areas around forests, and not in forests themselves. Climate-smart agriculture is one of the activities considered under REDD+ and should be complementary to the protection and restoration of forests and other natural ecosystems. If climate-smart agriculture were to displace forests, the costs associated with it would increase dramatically due to increased carbon emissions and soil erosion. In fact, by displacing forests, it would no longer be climate-smart. Afforestation/reforestation and FLR produce the largest carbon and soil erosion reduction benefits.

Pillar 4: Forest and rural livelihoods

The social and human impacts on forests have been widespread in Ethiopia. Population growth and poor agricultural productivity leads to significant forest areas cleared in favor of agricultural land uses, or degraded through unsustainable use. This is in part due to insecure tenure over trees and forested land, but also a result of the absence of participatory land use plans, and a lack of viable business opportunities and incentives for communities to maintain and sustainably manage forests and trees in the landscape. This component of the program pillar aims to increase the contribution of trees and forests to rural livelihoods. It addresses the specific issues relating to already heavily deforested agricultural landscapes, and looks separately at how to increase the relevance and contribution of forests to community livelihoods in forested landscapes. Although all pillars in this program require harmonized actions across sector mandates, this one is especially so. In order for implementation to succeed, harmonized strategy and collaboration is required across many sectors from federal to local level, including forestry, agriculture, energy, and infrastructure, to name the most important. Further, the effectiveness of the extension services system is highly critical for the success of this pillar.

²¹ Afforestation/reforestation, establishing plantations and FLR are distinguished from each other in the following way: Afforestation/reforestation is assumed to take place where planting and high maintenance is recommended, which can be relatively costly, establishing plantations refers to commercial tree planting for timber production and FLR, in comparison, includes also much less intensive and costly interventions on large areas such as area enclosures.



4.1 Purposeful tree planting to enhance tree growing in rural landscape

Large areas of Ethiopia have been heavily deforested, with very few trees remaining in the landscape.

The severe socio-economic consequences of this have been recognized and the country is currently planting over four billion seedlings each year with the aim of reversing this trend. Despite this enormous number of trees being planted each year, the success rate is not as expected and the rural population is increasingly faced with decreasing agricultural productivity due to erosion and poor water retention in soils. The main explanations for the poor successful rates of planting is that the trees planted do not create enough value to incentivize rural land users to engage in proper tree management and that selected sites and species are not appropriately matched. On communal land, low tree survival rates and a lack of maintenance resulted in the failure of many plantations established through mass mobilization. The underlying problems included lack of clear management objectives and no sense of ownership of the plantations by community members, resulting in trees being neglected and illegally harvested, and benefits not being shared equitably. International experiences from China and Korea have been adapted to the Ethiopian context for the purposes of developing this component.²² This component addresses onfarm trees, agroforestry and woodlots primarily to supply household needs or local markets with energy, poles, building materials and tree products (fruits, nuts, fodder, etc.). Pillar 2 addresses the organization of smallholders as outgrowers to larger-scale forest plantations targeting commercial markets and value chains.

This action proposes to adjust the planting procedure to make it very clear that trees are being planted for a purpose. Emphasis should be placed on domesticating and developing indigenous tree species that generate multiple benefits, i.e. fruit, fodder, timber and watershed protection. The main benefits that trees can provide for rural economies include:

- Fruit trees and indigenous trees with edible fruits (avocados, mangoes, etc.)
- Fodder
- Timber
- Wood fuel

The first step is to identify which multi-purpose tree species are most appropriate for which agro-ecological zone. Once this knowledge is available, a site-species matching should be carried out by the appropriate extension service provider for each parcel of land prior to planting. The site-species evaluation should be conducted prior to delivery of seedlings from the nursery. Thereafter, the land holders should be informed about why they are planting these different tree species and they should be trained in their management. Thus, extension services play a key role in assessing the land and creating awareness regarding the purpose of the specific trees that were planted in the respective areas.

22. See separate stand-alone document "International Experiences and Best Practices relevant to NFSDP", July 2016.



Extension should be adapted to the type of land and specific tenure arrangements in place where the trees are being planted. The following are main categories of relevant land types:

- Communal land
- Farmland (gully and farm boundaries)
- Individual homesteads and gardens (usually managed by women, see 7.1 for gender considerations).

4.2 Mapping and enhancing the contribution of forest resources to rural livelihoods in forested landscapes

Specific challenges arise in forested landscapes that require their own targeted strategies and actions to address them. Where forests are abundant, forest produce often has a low market value locally, even if on the national scale they are a scarce and valuable resource. Small village forests or individual trees that are not integrated into value chains fetch very low prices and hence provide little incentive to farmers to cultivate trees in agroforestry systems.

Land use planning can define what areas of forest should be maintained or converted to other uses, what areas of other uses should be converted to forests and clarify purpose, tenure, rights, beneficiaries, and management responsibilities for specific areas of forest. This can be done by scaling up participatory forest management (a generic term for many tenure models) to the national scale.

4.3 Supporting the development of forest based community enterprises

Profitability of forest enterprises is often severely hampered in rural areas by poor access to markets that does not render transportation of bulky forest products to even not-so-distant markets economical. Lack of affordable finance can also make it difficult for farmers to purchase improved inputs, labor and equipment to process and market high-quality produce. Investment will address business identification and development, grant support, and improve access to markets. The aim is to support business start-ups for diverse Small and Medium Forest Enterprises (including honey producers, carpenters, hay producers, service providers, etc.).

4.4 Formation and strengthening of farmer and community organization for forest based interventions

International experience has shown that even where legislative, institutional and incentives frameworks are optimal, the absence of farmer and community organizations can greatly limit the potential success of a national program. Conversely, where policy, legislative and incentive frameworks are sub-optimal, strong farmer and community organizations can still facilitate successful enterprise development if well organized. They can also advocate more coherently and effectively for necessary reforms.



Forests owned and managed as communal resources need to generate income to finance management activities and to maintain community interest in their long-term sustainable management. Past approaches to participatory management of forest resources have put most emphasis on environmental protection and conservation and less on commercially viable enterprise development. Lessons learnt in both Ethiopia and from international experience emphasize the importance of community-managed forestry being built on a sustainable enterprise model that is not dependent on project-based external financing that will not be sustained.

The lack of strong institutions (social organization and rules) means that benefits are either not generated in sufficient quantity, or are not shared equitably or transparently, leading to conflicts within the community and distrust of the management institutions. Long-term support to the establishment, strengthening and operations of community institutions will be provided to community organizations that have responsibility for management of shared forest resources.

4.5 Rural energy

Demand for energy for cooking and heating in Ethiopia far outstrips sustainable supply. Woodlots are estimated to supply 6.6 million (only 5.5%) of the total 120 million cubic meters roundwood equivalent of wood fuel supplied to the market – the rest coming from natural forest or ‘unknown’ sources. Further, the efficiency of conversion and use of wood fuel is typically low due to poor technologies for production of charcoal, and inefficient woodstoves. This in turn is driven by the low (or zero) cost of raw materials harvested from natural forests and woodlands, which creates no incentive to improve the efficiency of raw material use. Increases in supplies from managed forests and/or planted woodlots depend on the price of wood fuels rising sufficiently to create an incentive for entrepreneurs to invest. This will only happen when illegal or unsustainable ‘free’ sources of wood are controlled or exhausted. Hence most woodlots are only effective in regions in which natural forest resources are scarce or well-protected.

A number of programs to address unsustainable wood fuel consumption are underway, including for example the Ethiopia Clean Cooking Energy Program and Ethiopia Off-grid Renewable Energy Program, both World Bank-facilitated through the Carbon Initiative for Development. Ethiopia is also implementing a widespread rural electrification campaign. However, electricity rarely provides an economically competitive substitute for fuelwood due to electricity’s relatively higher cost per unit energy. Even when available, electricity is mainly used for lighting and small appliances, rather than cooking, and represents a small share of total household consumption in energy terms²³. On the other hand, the ambitious rural electrification program (to double the length of distribution lines in the next 5 years) will generate increased demand for utility poles – a potentially important market for woodlots and plantations.

²³ IEA (2015). Note: Households do not simply substitute one fuel for another as income increases, but instead add fuels in a process of “fuel stacking”. Modern forms of energy are usually applied sparingly at first and for particular services (such as electricity for radio and television, or LPG for making tea and coffee) rather than completely supplanting an existing form of energy that already supplies a service adequately. The most energy-consuming activities in the household – cooking and heating – are the last to switch.



Matching the supply of sustainable wood fuel to current and growing demand requires a holistic approach that controls supplies from illegal or unsustainable sources, increases the investment in managed forest resources, and the efficient conversion of wood along the value chain. Substantial reductions in overall consumption of wood fuel can be achieved by improving efficiency along the wood fuel value chain, from kilns that produce charcoal to cookstoves and ovens that use charcoal or wood.

Extensive extraction of fuelwood for both commercial and subsistence purposes is a driver of woodland degradation throughout Ethiopia. The demand for wood fuel in 2013 was 116 million m³ against 79 million m³ of sustainable supply (FSR, 2015). More than 40% of the annual charcoal supply to Addis Ababa is from the Rift Valley areas. The activity is aggravated by inefficient traditional charcoal production technologies. Fuelwood extraction is most prominent surrounding urban areas, as urban areas have high demand for fuelwood. The extent of biomass scarcity is exemplified by the long travel distances currently required for wood collection.

Most charcoal and wood fuel production are conducted informally without any license. Charcoal trade is characterized by weak law enforcement as the capacity to enforce regulations and effectively collect revenue is low. The vast majority of households depend on wood or charcoal for domestic energy consumption, using wood for cooking, heating and lighting. Traditional biomass (wood, charcoal, dung) accounts for approximately 90% of total primary energy use in Ethiopia and about 84% and 99% of urban and rural households, respectively, rely on biomass as their primary cooking fuel. Charcoal made using traditional earth mound kilns incurs considerable losses, entailing four or five times as much energy input as would be required for burning wood directly. Many account the loss of acacia woodland in the Central Rift Valley area to mainly charcoal production and firewood extraction. According to Ethiopia's recent Biomass Energy Strategy developed by the Ministry of Water Irrigation and Energy (MoWIE), there is a massive increase in charcoal consumption in the past 15 years due to the significant increase in rural incomes, proliferation of rural markets, improved road system and reduced transportation costs and the limited land for growing trees surrounding urban areas.



Table 7: Pillar 4 Action program areas and implementation strategies

Program area	Implementation strategy components	CBA (in NPV)
<p>Purposeful tree planting activities in the rural landscape</p>	<p>Promoting and developing woodlots and agroforestry by identifying which multi-purpose tree species are most appropriate for which agro-ecological zone. Once this knowledge is available, a site-species matching should be carried out by the appropriate extension service provider for each parcel of land prior to planting. This site-species evaluation should be conducted prior to delivery of seedlings from the nursery. Thereafter, the land holders should be informed about why they are planting these different tree species and they should be trained in their management. Thus, extension services play a key role in assessing the land and creating awareness regarding the purpose of the specific trees that were planted in the respective areas.</p>	<p>Expected to cost USD 607.4 million in labor costs and USD 1.3 billion in material costs. In terms of benefits, the activity is estimated to generate sales of firewood valued at USD 8.2 billion, carbon benefits of USD 1.6 billion, and soil erosion reduction benefits of USD 852.9 million.</p>
<p>Mapping and enhancing sustainable management of village forests</p>	<p>Scaling up PFM implementation to scattered village forests/ area closures:</p> <ul style="list-style-type: none"> • Identify and demarcate borders to parcels of forest to be managed in a specific manner, • Agree on the appropriate tenure model with all affected communities, for each parcel of forest, and woodland, • Clarify (the bundle of) rights; rules of access to forests/ forest resources and benefit sharing mechanisms, • Register parcels of forest land to agreed individual or community institutions, • Strengthen local management institutions for forested areas, where possible building on respected traditional institutions and practices like management of forests for religious beliefs, • Prepare participatory management plans for parcels of forests with full participation of all stakeholders, • Define the management responsibilities and who will be responsible for what, • Empower community institutions to enforce their own rules, with real consequences for non-compliance, • Ensure regular monitoring and feedback of performance results to the wider community. 	<p>Mapping of suitable PFM areas is expected to cost approximately USD 1.2 million in consulting costs. Actual implementation of PFM has already been costed under Pillar 3.</p>



Program area	Implementation strategy components	CBA (in NPV)
<p>Support the development of forest based community enterprises</p>	<p>Develop entrepreneurship skills and supporting business start-ups of small and medium forest based enterprises</p> <ul style="list-style-type: none"> • Support farmer groups to identify viable forest-based enterprises and livelihood improvement opportunities in agricultural and forested landscapes (whether designated or managed for production or protection). • Ensure access to affordable finance to tree farmers or forest managers to invest in crop production, processing and harvesting. • Provide public grant support to kick-start community and private tree-based enterprises and to support the sustainable management of identified parcels of forest land in accordance with agreed purpose and tenure. • Provide incentives or payments for environmental services to ensure environmental goods and services are produced in the long term by tree growers, forest owners or managers. • Improve access to rural areas in the context of an agreed land use plan (noting that in absence of a land use plan and clear tenure on forests, improved access can accelerate deforestation of newly accessible forests). 	<p>This activity is estimated to cost USD 101.2 million in grant payments and consulting costs.</p>



Program area	Implementation strategy components	CBA (in NPV)
Formation and strengthening of community based organizations	<p>Establishing and supporting national level Apex community organization</p> <ul style="list-style-type: none"> • Strengthen local smallholder, women, community and indigenous people’s producer or forest management organizations to produce and process forest products, improve bargaining powers for product sales, and access to inputs, and advice. • Strengthen regional associations of local organizations, that support producer organizations to become more effective individually and collectively, demand for services, aggregate forest product and sell in bulk, add value through processing, provide services to their supplier members, share experiences, and advocate for supportive regional legislation and service provision. • Strengthen organizations of national federations to advocate for more supportive national policies and incentives for forest sector development. 	<p>Estimated to cost USD 600,000.</p>
Rural energy development	<p>Improved and sustainable charcoal production from agriculture and forest by products:</p> <ul style="list-style-type: none"> • Establish market regulation — improve law enforcement to reduce the availability of unsustainable, illegal wood fuel on the market. • Increase the supply of sustainable wood fuel production through promoting woodlots and sustainable management of natural forests. • Provide incentives for establishment and management of woodlots (could be done in the context of REDD+). <p>Scaling up the use and distribution of improved cook stoves, given the significant amount of ongoing programs aiming to address the unsustainability of wood fuel demand, the NFSDP should aim to build on existing programs and fill the gaps where necessary.</p>	<p>The costs and benefits of this activity are included in 3.1.1.</p>

This pillar is expected to require the equivalent of USD 372 million in staff time.



Pillar 5: Urban greening and urban forests

Sustainable (pre-) urban forest planning and management has significant potential to contribute to a pleasant and healthy environment for the growing urban population. As a valuable natural resource, urban forest may provide a number of direct and indirect benefits, including climate regulation, noise reduction, watershed protection, recreational opportunities, outdoor education, wood and fruit production and habitat resource for wildlife. However, these opportunities have yet to be harnessed in the context of Ethiopia. This NFSDP aims to increase the attention of both policy-makers and citizens to the importance of establishing and maintaining green urban centers. Ethiopia already has an urban greening strategy, but given the novelty of these measures in Ethiopia, awareness raising will be a key aspect of this program pillar.

5.1 Urban greening

There are limited green areas in the urban centers of Ethiopia. The existing urban green areas are not sufficiently large compared to residential and commercial areas. The limited areas that exist are mostly abandoned lots, dominated by exotic and invasive plants. There is a lack of green infrastructure in urban areas. This means that the recreational and educational demands of the society living in and around the urban centers are not currently met. As Ethiopia's cities continue to grow, it is important to develop a strategy for integrating urban green infrastructure.

First, the limited national experiences will be assessed to define successful actions that can be upscaled. The Ministry of Urban Development and Housing developed an urban greenery strategy in 2014. Moreover, the National Urban green infrastructure standard was developed in 2015. Therefore, emphasis should be given to implementing the strategies and standards. To operationalize the strategies and the standards guidelines and manuals to guide the different specific actions need to be developed.

Despite the existence of these guidelines, many of Ethiopia's cities, including Addis Ababa, remain much below the UN recommended standard to have 9 square meters of greenery per person in an urban setting. Therefore, this component should focus on implementing and improving the existing strategies. Further, the urban population must be mobilized to gradually increase its contribution towards the achievement of this action program. Awareness raising will also be conducted on need, management and enhancement of the urban green areas in a way that the residents and institutions will own and sustainably manage these infrastructures.

There are a number of ways in which green spaces can be integrated into urban areas. These include neighborhood parks, green pathways and tree lining for streets, and playgrounds as an example. The objective of this specific action area is to bring the green spaces closer to the urban population, both in residential and commercial areas.



When planting trees in urban areas, care must be taken to ensure that infrastructure (such as buildings, concrete, streets) is not damaged by tree growth. Therefore, prior to launching this urban greening program, specific guidelines for different greening activities should be reviewed and refined. These guidelines should be continuously improved as the program is rolled out and lessons are learnt. The guidelines will also ensure that greening activities are harmonized across the country. Once the guidelines have been developed, the number and type of trees that are planted in urban settings should be increased.

5.2 Urban forests

Ethiopian urban areas are endowed with a variety of forest cover constituted mainly with exotic and few native species. The urban (and pre-urban) forests do not have management guidelines, infrastructure and recreational facilities to satisfy the growing demand for the recreational and educational needs of the society. Implementation of the urban forest development action program will be executed by developing management guidelines, establishing recreational facilities and infrastructures, and developing recreational programs. The urban population is sensitized on the objectives of the action program. Moreover, there will be upscaling of experiences both from within and outside the country. Awareness raising will also be conducted to generate continued demand for and use of urban forests.

Based on the international experiences reviewed during the Situation Analysis, Freiburg in Germany can provide a promising example for how Ethiopian cities, especially Addis Ababa, can develop its urban forests in a way that further valorizes the multiple benefits of forests in urban areas.²⁴ The main objective of forest management in Freiburg is nature conservation and recreation. How this experience can be applied to the Ethiopian context, including targets, is further described below. Freiburg municipality is committed to provide recreation opportunities within urban forests and to manage these forests sustainably, or what they call “close-to nature forest management,” where timber production is only a secondary management objective. However, the municipality also understands the importance of production forests, to not only meet the domestic timber demand but also as a source of additional funding for the city. While only a small proportion of Freiburg’s forests are designated for production, the forest is FSC certified. Forested land is sustainably harvested, generating income to cover forest management costs and contribute to the general budget of the municipality. The timber produced is then targeted to local timber markets, to further promote sustainability.

In the context of Ethiopia, the forests located around urban areas can provide similar products and services. In other words, forest cover can be maintained while timber harvesting can help to meet the growing demand for fuelwood and wood products for construction and furniture. First, however, there is a need to hold a public discussion on the desired role and objective of urban forest management in Ethiopia. Therefore, the urban forest guidelines must be developed in a participatory manner so as to recognize the values and priorities of Ethiopia’s urban population.

²⁴ See separate stand-alone document “International Experiences and Best Practices relevant to NFSDP”, July 2016.



Borrowing from the example of Freiburg, where recreation is of special importance to the residents of the city and tourism, the city has promoted the use of the forest by maintaining 450 km of forest paths. These paths can be used for walking, biking, wildlife watching, etc. Most importantly, this allows for urban residents to access the forest area and appreciate the clean air and natural beauty. This also supports the local economy around urban areas as this allows for local tourism business to develop by establishing restaurants and hotels. This may also provide opportunities for green employment generation, especially for youth.

Recognizing the importance of educating the urban population about the value of forest, this specific action calls for developing recreation programs that simultaneously serve to educate the urban population that may not otherwise have exposure to forests. Developing recreation programs to facilitate and encourage forest access for urban population will be realized through:

- Developing programs for birds and butterfly watching
- Developing programs for flower collection and identification
- Developing programs for environmental events (forest, biodiversity, environment, earth and water day celebrations)

Table 8: Pillar 5 Action program areas and implementation strategies

Program area	Implementation strategy components	CBA (in NPV) ²⁵
Urban greening	Infrastructure development for green areas by increasing green area development and public recreation land utilization coverage to 30% by 2020 (GTP 2).	This activity is expected to cost USD 8 million in construction, materials, and labor costs.
	Implementing urban greening guidelines for species selection, planting and management of trees through easily accessible recreation facilities that improve the living standards of urban populations while maintaining educational elements: <ul style="list-style-type: none"> • Constructing walkways, avenue plantations, tree lining on streets • Building sitting facilities and playgrounds • Producing and erecting billboards for educational purposes. 	Costs for this activity are included in overall staff time costs for the pillar.
Urban forest development	Develop management plan for urban forests in 11 regional cities by demarcation and mapping of urban forests in 11 municipalities (one per regional state) and develop sustainable management plans for multiple use validated through stakeholder participation.	Cost USD 144,000.
	Establish recreational facilities and infrastructures in urban forests and green areas: <ul style="list-style-type: none"> • Constructing walkways and recreational facilities • Supporting local tourism industry • Putting in place children playing grounds • Botanical gardens. 	Cost USD 8 million in infrastructure, materials, and labor costs.

This activity is expected to require the equivalent of USD 2.4 million in staff time.

²⁵ Staff time valued at the equivalent of USD 2.4 million is required for this pillar.



Pillar 6: Cross-cutting components

The following actions are cross-cutting in that they apply to all pillars.

6.1 Gender

Successful implementation of the NFSDP requires adherence to principles of equity, community cohesion and mobilization. When devising natural resource management strategies, the complex relationships in different socio-cultural settings, especially with regards to gender, must be taken into account. Gender relationships influence the production, collection, distribution, purchase and final consumption of and forest product consumption patterns, such as fuelwood and other bio-fuel substitutes. Given gender roles in terms of natural resource and forest management, the following aspects need to be considered:

- Men and women's different roles in production at the household level and within the community
- Cultural or gender norms around ownership and management of natural resources including livestock
- Women's "triple role" burden
- Access to gender sensitive extension services
- Access to productive assets and credit.

The NFSDP will ensure gender mainstreaming is a key component that is taken into account at all levels during the Program especially in terms of equitable access to assets and other livelihood support systems among women and other marginalized groups. As well as in terms of the enhanced capacity of women and other marginalized groups to actively participate in and have equitable control in decision-making processes. Monitoring will be important to evaluate the impact of the gender mainstreaming activities.

6.2 Demography

Ethiopia's trend is that demographic growth continues placing significant pressure on natural resources. Thus, it is critical to position family planning in the central sphere of development to reduce population growth and pressure on the natural resources sustainably. Currently, there is high institutional and policy readiness to implement health and family planning programs. For example, the Health Extension program has been evaluated as the biggest factor in Ethiopia's success to reduce the total fertility rate (the average number of children born to a woman in her lifetime) from 5.5 to 4.8 between 2000 and 2011. The program has invested in a network of more than 38,000 frontline health extension workers based at more than 17,000 health posts to bring education and contraceptive products and services to rural areas that previously lacked trained health personnel and high-quality facilities.²⁶ The NFSDP must ensure this pro-gram continues to be implemented successfully and that awareness is raised within the Health Extension program of the importance of addressing population growth for the sake of forest sustainability.

²⁶ MEFCC REDD+ Secretariat, "Study of causes of deforestation and forest degradation in Ethiopia and the identification and prioritization of strategic options to address those" Draft Final Report, November 2015.



6.3 Integrated land use planning for forests

Given the majority of forest loss and degradation stems from pressures outside the forest sector, an integrated multi-sectoral land use plan is critical for the maintenance of forest health and for the success of the NFSDP. Without the integration of forest priorities into the land use plans of other sectors, there is a large risk that Ethiopia's forests will be converted to other land uses or continue to be degraded.

6.3.1 Land use planning

It is important to recognize the number of ongoing land use planning processes and other initiatives of relevance to land use planning. These include the national Masterplan for land use planning housed in the Ministry of Agriculture and Natural Resources (guided by the Prime Minister's Office) that is currently receiving pronounced political attention; Forest Landscape Restoration, which entails a range of approaches to improving land productivity through forest establishment and management; the Sustainable Land Management Program, that is currently carrying out land use planning at the watershed level; the land registration and certification process led by the Agriculture Investment and Land Administration Agency; and land use planning being carried out at the regional level (e.g. Gambella and Amhara) These should be streamlined in a way that ensures forest sector development can be carried out.

Rural development that fully integrates the potential contributions of forests and trees requires coherent planning and investment across many sectors. Land use planning at the Regional State/ Zonal levels will identify land potentials and set broad policy goals for all sectors. Land use planning at the zonal, Woreda or Kebele level can allocate land to specific uses that contribute to the achievement of higher level goals. Forest tenure and resource rights will then be secured in accordance with land use plans that have been agreed between all stakeholders at the local level, which clarifies the purpose and optimal management of land, and rights to resources within the entire landscape.

6.3.2 Clarify land use and scale up secure tenure on land for forestry purposes

Secure tenure and rights are a prerequisite for long-term sustainable management of all forests – whether natural or planted, state, privately- or communally-owned or for commercial, environmental or socio-economic purposes. In the absence of secure tenure on forests and trees, or rights to benefits from those one has invested in, investments will not be made, or short-term profits will be reaped before longer-term benefits of forests are realized, often inequitably. Forest and tree tenure remains uncertain or insufficiently secure in many Regional States to engender long-term commitment to sustainable management.



Land use planning is closely linked to land and forest tenure security. Therefore, the land use planning and land registration and certification processes should be closely linked. Clear analysis will be conducted of the advantages and disadvantages of tenure models to achieve identified goals and respect local socio-economic conditions, including a) joint management of State-owned forests b) community forests; and c) management of private forests. Lessons will be drawn from Regional States such as Oromia and SNNPR whose Forest Proclamations (actual or draft) provide more scope for securing communal and private tenure on forests and rights to forest resources. These lessons should then be applied to ongoing policy and regulatory reform processes to ensure an optimal mix of tenure models in a landscape approach. In summary, the NFSDP seeks to collaborate with other sectors in preparing and implementing national and regional level land use plans that clarify forest and tree tenures and rights of all forest types and management models.

6.4 Climate change adaptation

Ethiopia's climate is changing – resulting in increased *variability* with greater risk of extreme weather events, such as prolonged drought, storms and floods. Impacts of climate change on forests resulting from a range of factors can be multiple. The knowledge about potential climate change impacts in different forest ecosystems in Ethiopia, and current understanding of regional differences in vulnerability, is limited. Nonetheless, there is general consensus that the frequency and severity of extreme events and slow onset changes will have substantial impacts on forest ecosystem health and functioning. As a result, the value of forest ecosystem services is likely to further increase as a result of climate change, and negative impacts of climate change are likely to outweigh positive trends – especially in the drier parts of Ethiopia. One of the major challenges for forest owners and stakeholders in the future will be managing the uncertainty caused by climate change.

Potential direct impacts of climate change on forests include: drier conditions increasing the risk of fire in forests and woodlands; a shift in distribution and extent of natural habitats and related biodiversity; more favorable conditions for invasive species; and negative impacts on forest-dependent livelihoods and forest industries. Indirect impacts on forests include changing climate conditions, in particular by making agriculture more precarious in current agricultural production areas, driving farmers to move into higher rain-fall areas – which are the woodland and forest areas; increasing demand on forests to diversify source of livelihoods; and creating perverse incentives such as Government programs intending to enhance food security, climate resilience in forested or wooded landscapes may unintentionally drive deforestation.



Revised management strategies and practices for all forests and trees (production, natural and on-farm) will be necessary to adapt to climate change. Ethiopia must invest in specific forest-related research about the trends and impacts of climate change to develop adaptation technologies. Provision of information about climate change, impacts and adaptation techniques, training and affordable finance to all forest managers (commercial, conservation, farmers) will play a key role in building their “adaptive capacity” to implement planned adaptation strategies and techniques. Policy interventions should further encourage social networks that promote group discussions and improve information flows and enhanced adaptation to climate change, recognizing the climatic and socio-economic variability across Ethiopia’s agro-ecological zones. Implementation of adaptation must be mainstreamed into ongoing ‘land-scape approaches’ to land management at the appropriate local scale.

6.4.1 Adapting the forest sector to climate change

Adaptation to climate change requires action across all components of the NFSDP. Some actions are quite general and provide a framework for subsequent actions – for example land use planning, securing tenure, and conducting research. Other actions are quite specific to the type of forest management. The general actions required include conducting the necessary research to understand the trends and impacts of climate change; developing strategies and technologies that respond to these impacts; and building capacity of extension staff and forest managers to take up new strategies and technologies. Adaptation to climate change needs to be mainstreamed across all aspects of the NFSDP, rather than as a stand-alone component. Some actions are quite general and provide a framework for subsequent actions – for example land use planning, securing tenure, and conducting research. Other actions are quite specific to the type of forest management. It will be important to engage EEFRI in first year of NFSDP implementation to conduct the research necessary to establish the baseline and develop appropriate and feasible targets for this component. These targets will then be subject to periodic reviews as the program is implemented.

6.4.2 Contribution of forests to climate change adaptation

It is important to consider how forest ecosystems may adapt to climate change and then how forests might be used to assist Ethiopia and its communities to adapt to climate change, two closely related aspects. “Adaptive capacity” consists of the inherent adaptive capacity of trees and forest ecosystems and of socio-economic factors determining the capability to implement planned adaptation. Adaptive capacity is therefore influenced by the level of management in any particular forest or forested area. Forests are particularly sensitive to climate change, because the long lifespan of trees does not allow for rapid adaptation to environmental changes. Associated with climate change, there are several factors affecting forest ecosystems, which can act independently or in combination.



The knowledge about potential climate change impacts in different forest ecosystems in Ethiopia, and current understanding of regional differences in vulnerability, is limited. Nonetheless, there is general consensus that the frequency and severity of the impacts from the range of factors affecting forest ecosystem health, functioning, and the delivery of ecosystems services is likely to further increase as a result of climate change. The inherent adaptive capacity of Ethiopia's tree species and forest ecosystems to these factors is also poorly understood. However, the negative impacts of climate change are very likely to outweigh positive trends – especially in the drier parts of Ethiopia. These different impact factors will affect Ethiopian forests. However, the severity of impacts on forest goods and services will depend on the regional context and the specific changes in climate.

One of the major challenges for forest owners and stakeholders is managing the uncertainty caused by climate change. Forest management strategies and practices are likely to adapt to changes in growth rates, shifting species and provenance suitability, and increasing risks of disturbance, in particular drought, fire and wind. Since these changes will probably occur at a faster rate than the rate at which ecosystems are able to adapt autonomously, forest management needs to support adaptation with targeted and planned measures. Research in Europe has identified many adaptive management measures for plantation forestry, including modifications in the choice of species, rotations, thinning schedules, harvesting operations, drainage and other activities that can support responses to the changing climate. However, similar studies have not yet been conducted in the specific context of Ethiopia.

As precise forecasts of future climate conditions are not expected, it is crucial to incorporate better uncertainty and risk factors into adaptive forest management. The most common forms of adaptation practices currently used by households include (a) crop selection of drought-tolerant crops; (b) terrace rehabilitation; (c) soil erosion prevention programs; and (d) homestead or forest restoration and change of planting dates. Income diversification strategies (including migration, non-timber forest product sales, handicrafts, and timber sales) were not common. The households in these areas (drought-prone highland, midland, and lowland areas) already face significant deprivation currently, with the majority of surveyed households reporting food shortages during part of the year. Social capital, represented by farmer-to-farmer extension and the number of relatives in local area, also affects adaptation to climate change positively. Policy interventions which encourage informal social networks (financially or materially) can promote group discussions and improve information flows and enhanced adaptation to climate change. Moreover, farmers living in different agro-ecological settings used different adaptation methods. Thus, future policy must provide adaptation technologies through targeted research in each agro-ecological zone.



Finally, it is highly important to build adaptive capacity among forest managers. The NFSDP proposes MEFC should work with Regional State Environment and Forestry Bureaus and service providers to develop new skills for forest management that adapts to climate change. Training specific to climate change adaptation will be integrated into other forestry and SLM training packages. Monitoring of progress will be disaggregated by gender and other social groups (age, wealth) to allow monitoring of social equity of the program.

Table 9: Pillar 6 Action program areas and implementation strategies

Program area	Implementation strategy components
Gender	<p>Gender mainstreaming is taken into account at all levels, especially in terms of equitable access to assets and other livelihood support systems among women and other marginalized groups, and enhanced capacity of women and other marginalized groups to actively participate in and have equitable control in decision-making processes. Monitoring will be important to monitor the impact of the gender mainstreaming activities.</p>
Demography	<p>Promote ongoing family planning initiatives such as the Health Extension program which has successfully reduced fertility rates.</p> <p>Raise awareness regarding the importance of addressing population growth for the sake of forest sustainability.</p>
Integrated land use planning for forests	<p>Land use planning measures:</p> <ul style="list-style-type: none"> • Promote participatory cross-sectoral land use planning at the local scale to identify and clearly designate land to achieve agricultural, forestry and other objectives, optimizing tenure models to the specific socio-economic context; • Ensure land use plans are designed to minimize risks related to climate change; • Forge better communication and harmonization between forestry, agriculture and energy sector strategies to address supply–demand imbalances through strategic programs; • Apply social and environmental safeguards during land use planning and the designation of sites for new protection and production forests, with particular attention on the impact of trees on hydrological functions (especially dry season flows), access rights in proclaimed forests (whether protection or production) and benefit sharing in communally owned or managed forests; • Based on land use plans, upscale SLM initiatives beyond micro-catchments, integrating forestry and tree-planting opportunities into landscape approaches. <p>Tenure security measures:</p> <ul style="list-style-type: none"> • Refine and promote the implementation of simple legal procedures by which individuals, and communal groups can secure tenure on forest land and clarify resource rights in forests under different tenure models; • Support farmers and communal forest owners to secure tenure and rights to forest resources in accordance with agreed land use plans to ensure confidence to plant, manage, harvest and sell forest products profitably.



Program area	Implementation strategy components
<p>Climate change adaptation</p>	<p>Adapting the forest sector to climate change:</p> <ul style="list-style-type: none"> • Invest in long-term meteorological monitoring to understand climatic trends, and in research to understand the impacts of measured or predicted changes on forests and their functions in each agro-ecological zone; • Establish early warning systems for fires and drought risk, making use of existing infrastructure and systems such as the IGAD Climate Prediction and Applications Centre (ICPAC) - http://www.icpac.net/; • Research and develop improved techniques and strategies for forest management that respond to measured and predicted changes in climate and their impacts on forests, tailored to each agro-ecological zone; • Mainstream forest-related adaptation technologies into ongoing SLM and other relevant initiatives at the appropriate local scale; • Provide capacity building and affordable finance that can support forest managers to implement strategies and actions to adapt forest management to climate change; • Adapt management strategies and practices for production forests and trees to changes in growth rates, shifting species and provenance suitability, and increasing risks of disturbance, in particular drought, fire and wind; • Modify the choice of species, rotations, and thinning schedules, harvesting operations, drainage and other activities; • Identify sites of high biodiversity conservation value (unique ecosystems, endemic species) at risk of [local] loss resulting from climate change and develop conservation strategies and integrate proposals for their management into relevant land use plans. <p>Contribution of forest sector to climate change adaptation:</p> <ul style="list-style-type: none"> • General adaptation techniques include robust site-species planning considering the impact of increasingly likely ex-treme events and slow onset climate change as well as production diversification; • Develop adaption strategies for all forest ecosystem types, including woodlands, adapted also to different management arrangements; • Integrate forests and trees into farming systems to improve on-farm climate resilience; reduce rates of erosion in high rainfall events; improve water infiltration; serve as windbreaks; and diversify farm products and incomes; • Make judicious choice of species, planting sites and densities, to address the fact that trees compete with other crops for limited water resources; • Promote adaptation policies to emphasize the crucial role of providing information on better production techniques and on climate change (through extension) and creating the financial means through affordable credit schemes to enable farmers to adapt to climate change.

Cost-Benefit Analysis

Investments required to implement the NFSDP

The cost-benefit analysis estimates nominal costs and net present value costs and benefits for the NFSDP pillars.²⁷ In this analysis, future costs and benefits are discounted at a 5% annual rate. Discounting is used in order to be able to compare costs and benefits that occur at different times. In order to calculate net present values, the analysis first estimated cash flows – both costs and benefits – across many years. These estimations take into account the irregular nature of productivity and growth of forests.



The analysis is based on existing information in Ethiopia, which is complemented by international experience in developing similar programmatic activities. Detailed assumptions have been provided as an annex. Table 10 below shows key assumptions that are cross-cutting across many pillars. For three key variables: the discount rate, price of farm labor, and the price of a ton of CO₂, we have performed a sensitivity analysis.

Table 10: Cross-cutting assumptions

Financial variables		
Discount rate	5%	Long-term Ethiopia average
Labor variables		
Farm labor per day	\$2	MEFCC 2015 Forest Sector Review
Jobs per hectare, plantations	0.10	MEFCC 2015 Forest Sector Review
Jobs per hectare, PFM, conservation	0.01	REDD+ Oromia
Ethiopian Government staff time	15%	Consultant estimate, Africa
Environmental variables		
Price ton CO ₂	\$5	
Soil erosion value per hectare of natural forest	\$49	UNDP 2016
Carbon stock improved management of natural forest tCO ₂ /ha	238	MEFCC 2015

Benefits are calculated for each activity where benefits can be reliably quantified and monetized. Some activities, such as Pillar 5: Urban greening and urban forests, will generate important benefits for Ethiopia, but these benefits are difficult to estimate and thus are not calculated in this analysis. In order to avoid double counting, activities that overlap between pillars – i.e. improved cookstoves – are only counted under one pillar.

Benefits from revenues are based on the sale of goods produced in selected pillars. Cost-savings are calculated from the reduction in expense due to the planned investment. Installation of cookstoves, for example, is expected to reduce expenses on fuelwood.

In addition to direct monetary benefits generated through revenues and cost-savings, the cost-benefit analysis estimates the value of carbon sequestration and reduced soil erosion. Carbon benefits have been monetized based on the assumption of \$5 per ton of CO₂ sequestered or avoided. The monetary value of reduced soil erosion benefits is based on a study “The Contribution of Forests to National Income in Ethiopia and Linkages with REDD+,” which estimates the annual value of Ethiopia’s natural forests (MEFCC, unpublished). We estimate a per hectare per year value of natural forests to agriculture from erosion reduction. Since the individual activities supported by the NFSDP will not all generate the

²⁷ While nominal costs present the unadjusted cost of an activity, net present value calculations are based on the “time value of money” concept: that a dollar today is worth more than a dollar tomorrow.



same soil erosion benefits as natural forests, the per hectare per year value is discounted relative to the expected biomass growth in a given activity. In order to compare the cost-effectiveness of different activities, a benefit/cost ratio is calculated for each activity where benefits are estimated. The benefit/cost ratio is the total benefits divided by the total costs.

While the cost-benefit analysis can be a helpful tool to aid decision-making, it has important limitations. First, the analysis is based on a number of assumptions that have a varying degree of confidence. Assumptions about the productivity of plantation forests, for example, are not site-specific, meaning that actual productivity will differ from the models used in the analysis. The analyses of individual activities should not be seen as investment-grade feasibility studies. The authors have attempted to demonstrate some of this uncertainty by including sensitivity analyses, but it is impossible to capture the full range of possible values of the NFSDP with the analysis. For transparency, a full list of assumptions used in the analysis is included as an annex.

Second, the cost-benefit analysis is unable to capture the complete costs and benefits of the NFSDP. The opportunity cost of land, for instance, has not been included in the analysis because the authors are unable to confidently estimate opportunity cost prior to sites being identified. The analysis assumes that land is being provided at no cost by the government or communities, yet the authors acknowledge that this excludes the opportunity cost of current land use. Another important cost that has not been included is the potential effect of climate change on the areas of the NFSDP. The authors have omitted this consideration because of the great uncertainty surrounding climate change impacts, but they should not be forgotten. In addition to affecting productivity, adapting to climate change may require additional costs, such as adapted management regimes of productive forests, for example. A final important omission to mention is the ecosystem services that forests and other ecosystems provide. As much as possible, the analysis attempts to capture these services, including roundwood production, firewood production, NTFP production, carbon sequestration, and soil erosion reduction. Other benefits of natural ecosystems, such as providing habitat for biodiversity, are not included in the analysis because the authors are unable to confidently quantify and monetize the value of these services. It is important to acknowledge that forests and other natural ecosystems have many values that go beyond what can be monetized. Cost-benefit analyses unfortunately are not able to capture the full value of forests. As such, the authors expect that the full value of the NFSDP is higher than estimated, even if it cannot be confidently calculated.

Third, the monetization of costs benefits of the NFSDP for the cost-benefit analysis has drawbacks as well as advantages. On the one hand, monetizing benefits allows stakeholders to compare the value of different services – without assigning monetary values, it would be difficult to compare a ton of CO₂ to a dollar earned from timber sales, for example. On the other hand, however, monetization hides important differences between the different costs and benefits and to whom benefits accrue. Prioritization of activities of the NFSDP depends on the benefits that stakeholders most want to promote. Different



pillars may be prioritized if stakeholders place greater emphasis on financial, social, or environmental benefits of the NFSDP. A prioritization analysis is considered in greater detail below.

This analysis is based on the targets preliminarily agreed to with MEFCC and other stakeholders. Table 11 provides an overview of nominal costs, disaggregated by pillar.

Table 11: Nominal costs (all costs in USD millions)

	GoE staff time investment	GoE expenditure investment	Private investment	Smallholder labor investment	Smallholder expenditure investment	Total
Pillar 1: Enabling environment	4.0	26.6	0.0	0.0	0.0	30.6
Pillar 2: Sustainable forest production	462.0	938.4	1,808.2	263.3	70.0	3,541.8
Pillar 3: Forest environmental functions	1,204.3	3,129.3	46.4	4,220.2	615.6	9,215.8
Pillar 4: Forest and rural livelihoods	372.0	911.6	0.0	760.0	808.6	2,852.2
Pillar 5: Urban greening and urban forests	2.4	16.1	0.0	0.0	0.0	18.6
Pillar 6: Implementation framework	0.2	1.3	0.0	0.0	0.0	1.5
Total	2,044.9	5,023.4	1,854.6	5,243.4	1,494.2	15,660.5

Pillar 1 (Enabling environment), Pillar 5 (Urban greening and urban forests), and Pillar 6 (Implementation framework) are expected to have relatively low nominal costs. The full amount of these costs is expected to be borne by the Government of Ethiopia (GoE) or development partners. Pillar 3 (Forest environmental functions) has the largest total costs, but the majority of these costs are expected to be covered by in-kind community time investments. Pillar 2 (Sustainable forest production and value chains) also has high overall costs, but should leverage significant private sector investment if designed and implemented appropriately. GoE staff time for each pillar is assumed to be 15% of total pillar cost.

Expected benefits from implementation of the NFSDP

Table 12 summarizes total cost, net present value, revenues and cost savings, carbon benefits, soil erosion benefits, and employment generation for all pillars with estimated benefits. It is important to note that benefits were only calculated for specific activities. All costs associated with other pillars are captured in the “Other pillars” row.

Table 12: Summary of costs and benefits (all costs and benefits in USD millions)

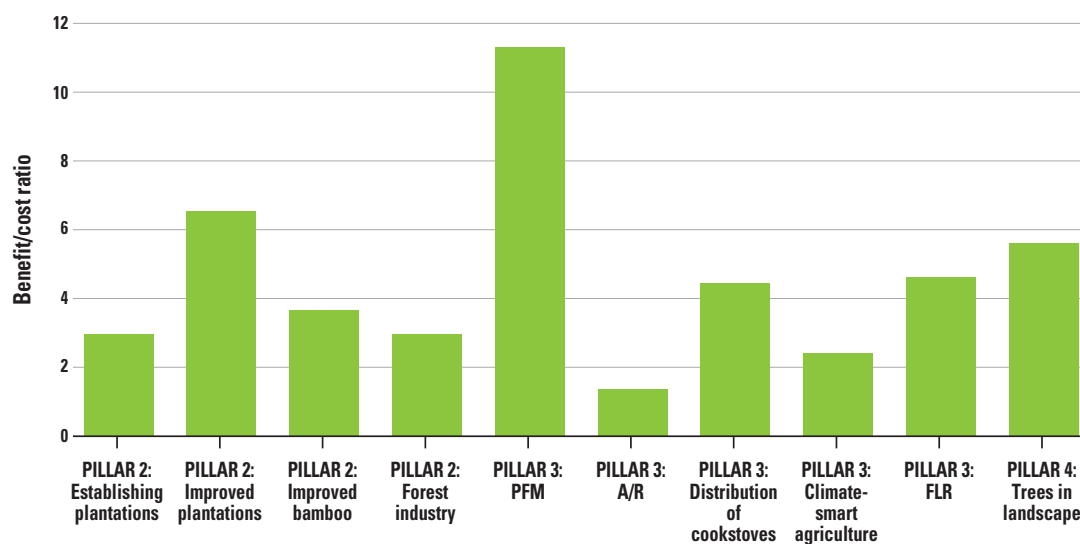
	Total nominal cost	NPV	Revenues and cost savings	Carbon benefits	Soil erosion benefits	Employment
Pillar 1: Enabling environment	809.7	1,221.2	1,451.9 43% - public enterprises 23% - private enterprises 34% - communities	277.3	138.1	35,000
Pillar 2: Improved management of plantations	35.1	165.2	65.1 81% - public enterprises 19% - private enterprises	95.3	34.9	18,000
Pillar 2: Improved management of natural forests	45.0	324.2	141.5 75% - public enterprises 25% - communities	156.8	57.5	15,000
Pillar 2: Improved management of bamboo	289.8	632.7	526.7 46% - public enterprises 43% - private enterprises 11% - communities	242.8	99.4	40,000
Pillar 2: Forest industry cluster development	1,900.0	2,115.2	3,313.8 100% - private enterprises	0	0	6,000
Pillar 3: PFM	712.5	5,633.9	2,459.2 25% - public enterprises 75% - communities	2,725.9	998.9	237,500
Pillar 3: A/R	1,329.9	284.9	498.2 50% - public enterprises 50% - communities	593.0	165.4	30,000
Pillar 3: Distribution of cookstoves	1,370.5	5,235.7	6,386.8 25% - private enterprise 75% - communities	394.2	0	51,641
Pillar 3: Climate-smart agriculture	3,283.1	3,949.1	6,896.8 100% - communities	144.3	52.6	0
Pillar 3: FLR	1,305.0	4,185.4	2,279.8 25% - public enterprises 75% - communities	2,225.9	845.2	150,000
Pillar 4: Enhance role of trees in landscape	1,305.0	4,185.4	2,279.8 25% - public enterprises 75% - communities	2,225.9	845.2	150,000
Other pillars	2,202.7	-	-	-	-	-
Total	15,660.5	30,831.0	32,261.0	8,492.0	3,245.0	633,141



The cost-benefit analysis shows that the NFSDP will efficiently create economic benefits for Ethiopia, with a net present value of USD 30.8 billion. The benefit/cost ratio is estimated at 3.3, meaning that more than three dollars of benefit are generated for every dollar invested. Revenues and cost-savings account for the greatest proportion of benefits at nearly USD 32.2 billion. Carbon and soil erosion benefits generate USD 8.5 billion and USD 3.2 billion, respectively. Costs and benefits of specific pillars and activities are presented in their respective sections.

Given the large difference in size of different pillars, their relative benefits are substantially different. It is also helpful to compare the benefit/cost ratios of different investments (Figure 5). Benefit/cost ratio represents the total expected benefits for every dollar invested.

Figure 5: Benefit/cost ratio of selected investments



PFM, improved plantation management, trees in landscape, FLR, and cookstove distribution all have benefit/cost ratios greater than 4. All other investments have benefit/cost ratios greater than one, meaning that they are profitable.

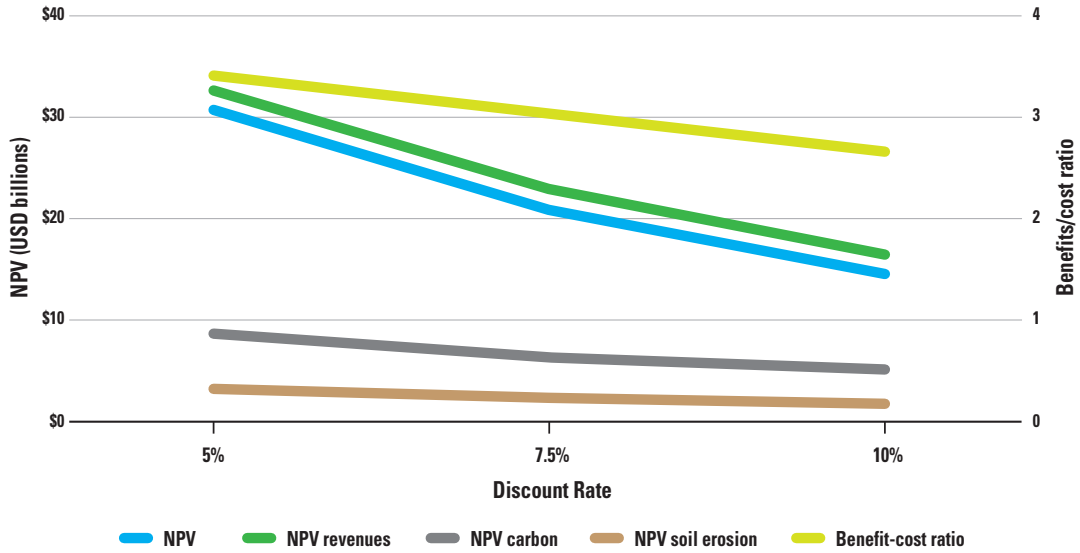
Sensitivity analysis

As stated above, there is a high degree of uncertainty associated with many of the important assumptions of the cost-benefit analysis. Sensitivity analyses allow stakeholders to test these assumptions and determine how costs and benefits change as input assumptions change. Sensitivity analyses were conducted for the discount rate, the labor wage rate, and the price of a ton of CO₂.



The discount rate is one of the most important assumptions in the cost-benefit analysis. 5% was chosen because this is the long-term average cost of borrowing for the Ethiopian Central Bank. However, different NFSDP stakeholders will have different opportunity costs of capital. The sensitivity analysis demonstrates how results of the analysis change according to different discount rates (Figure 6). The left vertical axis measures change in net present values for different variables in USD billions; the right vertical axis demonstrates the change in benefit cost-ratio.

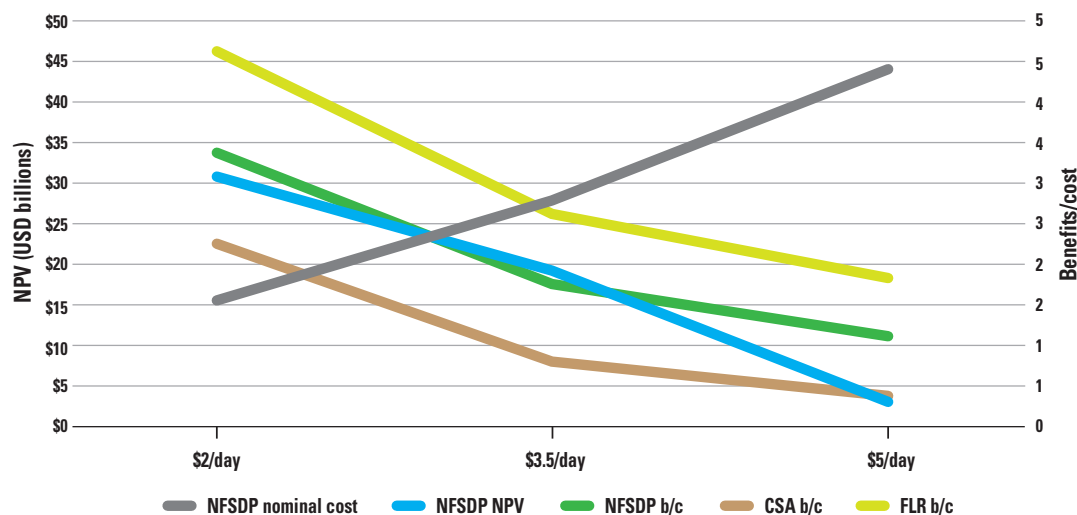
Figure 6: Sensitivity analysis for discount rate



Increasing the discount rate decreases the net present value of the NFSDP as a whole and each individual source of benefits: revenues, carbon, and soil erosion reduction benefits. Additionally, the benefit/cost ratio decreases as the discount rate increases. Compared to costs of the NFSDP, benefits tend to occur further in the future and discounting affects future values greater. However, even with a 10% discount rate, the net present value of the NFSDP as a whole re-mains positive at USD 14.5 billion and the benefit-cost ratio is still attractive at 2.7. While the NFSDP is sensitive to changes in discount rate, concerns about the discount rate should not prevent stakeholders from investing in the NFSDP.

Another highly influential variable is the assumed wage of two dollars a day for rural laborers. Higher skilled laborers, such as metalworkers constructing improved cookstoves, are assumed to be paid five dollars a day. Given the high labor intensity of the work in the NFSDP, outcomes of the analysis are highly sensitive to changes in wages. In order to demonstrate how costs and benefits are affected by change to wages, the authors conducted a sensitivity analysis for the daily rates of USD 2, USD 3.5 and USD 5, as summarized in Figure 7.

Figure 7: Sensitivity analysis for wage rate



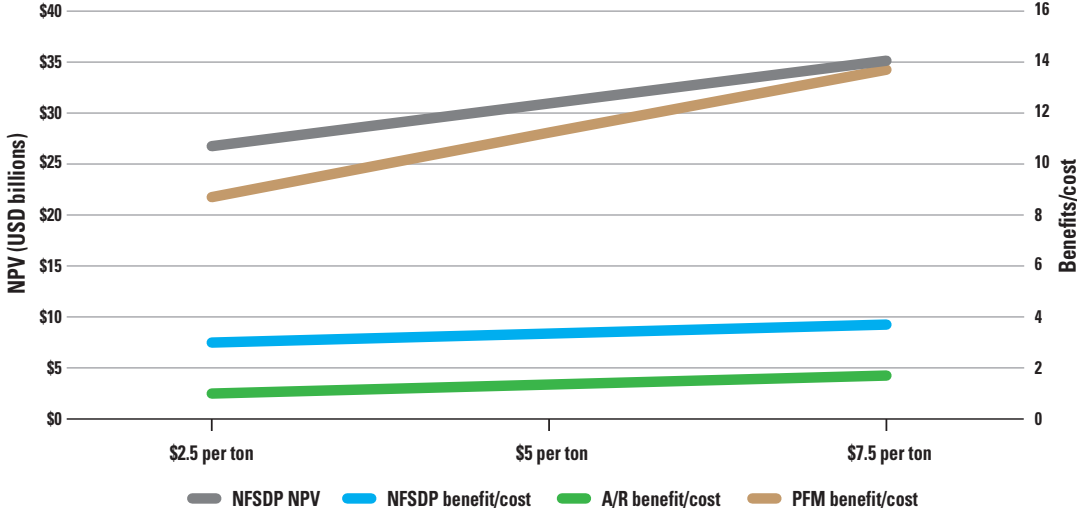
Nominal costs and net present value are represented in USD billions on the left vertical axis while benefit/cost ratios for the NFSDP as a whole as well as selected pillars are represented on the right vertical axis. Increasing farm labor wage has a great impact on the cost, net present value, and benefit/cost ratio of the NFSDP. Total nominal costs increase from nearly USD 16 billion to USD 44.0 billion at USD 5 per day. Net present value decreases from USD 30.8 billion to USD 4.6 billion at USD 5 per day while the benefit/cost ratio decreases from 3.3 to 1.1 at USD 5 per day. Despite this decrease, the NFSDP remains a profitable investment.

Changes in the wage rate affect certain activities more than others. Climate-smart agriculture, for example, would have a negative net present value and a benefit/cost ratio of less than one if wages rose to USD 5 per day. It is important to note that the cost-benefit analysis assumes that community labor is contributed in-kind for the climate-smart agriculture component. The analysis suggests that farmers would likely abandon agriculture if they were able to receive such high daily wages. Forest and landscape restoration would also be greatly impacted by increases in wages, as its benefit/cost ratio would fall from 4.6 to 1.8 if wages were to increase to USD 5 per day.

Finally, given the large potential to sequester carbon dioxide through the NFSDP and the high variability of the price of carbon credits in the global market, a sensitivity analysis of the price of carbon was conducted. The baseline cost-benefit analysis assumes a price of USD 5 per ton of CO₂; the sensitivity analysis, shown in Figure 8, demonstrates how the NFSDP is affected by a price of USD 2.5 per ton of CO₂ and USD 7.5 per ton of CO₂.



Figure 8: Sensitivity analysis for price of carbon



Compared to the discount rate and the wage rate, the price of a ton of CO₂ has a smaller impact on the value of the NFSDP. This is due to the fact that carbon benefits only account for approximately 26.4% of the benefits of the NFSDP.

At a low carbon price scenario of USD 2.5 per ton, the net present value of the NFSDP is USD 26.6 billion compared to USD 35.1 billion at USD 7.5 per ton. The benefit/cost ratio increases from 3.0 at USD 2.5 per ton to 3.7 at USD 7.5 per ton.

A change in the price of carbon has a high proportionate impact on afforestation/reforestation and PFM, which is due to the fact that a large percentage of the benefits they generate come from carbon. The benefit/cost ratio of afforestation/reforestation increases from 1.0 at USD 2.5 per ton to 1.6 at USD 7.5 per ton. The benefit/cost ratio of PFM increases from 8.8 at USD 2.5 per ton to 13.7 at USD 7.5 per ton.



Part 5: Implementation Framework

High political ambition for green economy

Ethiopia is one of the front runner countries in supporting and endorsing many international processes and commitments. It is also one of the pioneer countries to develop its own Climate-Resilient Green Economy strategy to mitigate and adapt to the negative effects of climate change. The National Forest Sector Development program should be recognized and endorsed as a national program to operationalize the CRGE goals of the nation. It should be launched by high level political leadership to show the commitment of the nation to its implementation. It is assumed that the current level of political ambition for developing green economy will continue during the implementation period of the NFSDP.

Strategic communication plan

The successful implementation of the NFSDP requires mobilizing all relevant stakeholders at all levels. The implementation of the action programs and the benefits obtained should be documented and publicized against the baseline. The implementation progress, status reports and lessons learnt should be documented and reported in a way that shows the contribution of the sector to the national goals and international commitments. In this regard, lessons can be learnt from the CRGE communication strategy.

Implementation strategy:

- Preparing forest sector strategic communication plan.
- Organizing awareness creation workshops, forest days at all levels.
- Organizing multi-stakeholder platforms to better coordinate intersectoral issues.
- Strengthening collaboration with development partners.
- Preparing forest sector country status reports as required to indicate progress achieving national and international commitments and targets.
- Creating awareness on the provisions of the forest policy, strategies, law, regulations, directives and guidelines. Continually raising awareness is crucial to inculcate the notion of forestry as a business in addition to its environmental services.
- Including Forest and Environmental education starting from primary school as curricular and extra-curricular activities.

Target:

- Regular media coverage for the sector to inform the public sector achievements and challenges.
- Annual forest day events.
- Bi-annual multi-stakeholder platform events.
- Preparation of annual progress and status reports.



Importance of Regional Forest Sector Development Programs

In Ethiopia, the state owns all natural forests, woodlands and industrial plantations. Sub-article 2 (d) of Article 52 of the Constitution entrusted the power to administer land and natural resources to the regional states in accordance with policies and laws enacted by the federal government. In addition to the state forests, large areas of smallholder or community plantation woodlots also exist in the regional states that need technical and organizational support from the regional governments. Moreover, there are huge differences between regions in the forest resource base, types and socio-economic contexts. This implies that regional states have the responsibility to develop and implement context specific Regional Forest Sector Development Programs that are aligned to the NFSDP master plan.

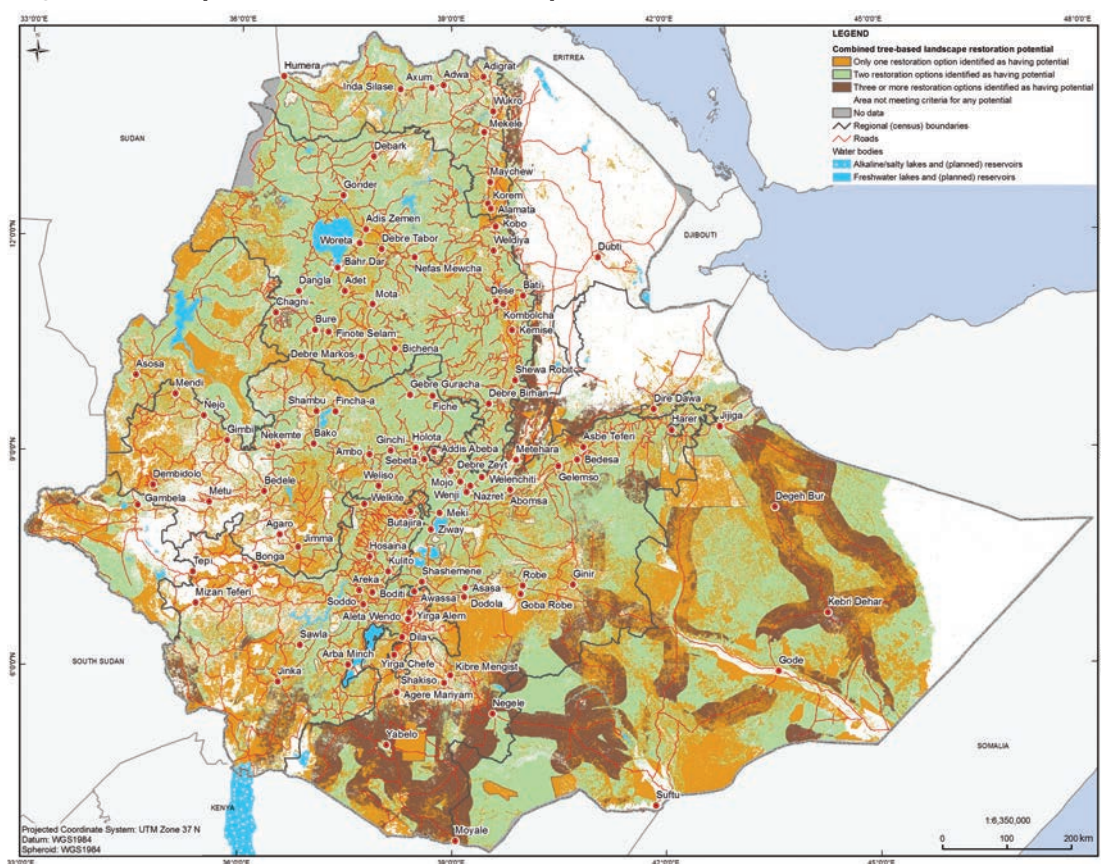
The NFSDP provides the framework for national programming, which in turn provides the basis for Regional Forest Sector Development Programs. Therefore, it is assumed that the development of the Regional Forest Sector Development Programs immediately follows the endorsement of the NFSDP. This action plan provides the basis upon which to propose an institutional and functional structure relevant to effective implementation of the NFSDP at the regional level. The exact location of different activities will be defined at the regional level, where local institutions can engage the relevant stakeholders and rural land users to ensure the pro-posed NFSDP activities are implemented in a concerted fashion that is preceded by the necessary community consultations. The implementation approach can be informed by existing initiatives that consolidate available forest information.

The WRI/MEFCC FLR mapping exercise has already preliminarily identified the areas where FLR opportunities are strongest (Figure 9). The WRI mapping exercise is based entirely on remote sensing data and should be considered a preliminary outcome at this stage. Recommended next steps to ensure full benefit of the maps include:

- i. **Ground-truthing of the maps using Mobile Application:** MEFCC is in the process of ground-truthing the restoration potential maps, in four Woredas. This requires 50 data points per potential (across all four Woredas) for a statistically significant number of data points (350 across all eight restoration potentials, as some data points can be used for more than one potential). Results from the four Woredas will indicate which of the input maps was most reliable and the highest priorities for refinement. In addition, this ground-truthing approach should be extended to other Woredas as feasible.
- ii. **Incorporate regional-level datasets where possible:** Current mapping is done based on national-level land use maps. However, regions sometimes have more accurate regional-level maps. As Regional FSDPs are prepared, regional data should be substituted where available to improve the quality of the maps.

- iii. **Refine national maps with improved data, as it becomes available or feasible:** Section 3.5 of the “Ethiopia National Tree-Based Landscape Restoration Potential Maps” assesses the strengths and gaps of the input maps. Some of the input maps used were unofficial, outdated or incomplete (e.g. basin and watershed boundary maps are unofficial, land degradation maps are based on very low-resolution data, which limits its accuracy). As improved data becomes available, these map layers should be updated.

Figure 9: Overall potential for tree-based landscape restoration



Source: MEFCC/WRI National Potential and Priority Maps for Tree-Based Landscape Restoration in Ethiopia. DRAFT Version 1.0, September 30, 2016.

Implementation strategy:

Regional Forest Sector Development Programs development will include multi-stakeholder consultation at regional level, community consultation and participation and building the implementation capacity of regions and executive bodies. It will consist in two core components: analyzing the forest situation in each region and detailing regional action programs.



Component 1. Analysis of the forest situation in the regions

Analyze the existing situation of the forest sector in each region, including resources, trends and efforts.

1. Review and analyze the forest resource base including timber and NTFP demand and supply, forest resource structure, productivity, management and utilization.
2. Analyze the opportunities and challenges of the forest sector in each region, including determination of suitable land availability for forest expansion to achieve regional and national targets.
3. Take stock of existing forestry development initiatives, their extent, and historical trends.
4. Review regional, legislative and regulatory frameworks relevant to forestry planning, implementation, and monitoring.
5. Analyze the existing institutional arrangement and administration of the forest including the research, education and training system.

Component 2. Detailed regional action programs

Develop detailed regional-level initiatives. These initiatives may focus on enabling environment, capacities for resource monitoring and assessment, forestry extension programs, the role of the private sector and the forest based industry and value addition. Suitable initiatives include:

1. Develop sustainable forest management capability, remote sensing and regional forest resources survey.
2. Develop forestry extension program for plantations, NTFPs, various agroforestry systems and silvo-pastoralism.
3. Develop regional forestry research, education and training.
4. Develop 2-3 investment proposals for the private sector to engage in forest plantation and industries processing timber and non-timber forest products.
5. Create enabling environments to enhance forestry planning, implementation, and monitoring.
6. Create action plans to strengthen the forestry industry, value chains and marketing systems for timber and non-timber forest products in the regions.
7. Develop forest emergency services including forest fire and pest management (to the extent not covered at the national level).

Target:

- Regional Forest Sector Development Programs in 2016/17 Ethiopian fiscal year.



Finance

The situation analysis showed that finance is one of the main barriers to action within the forest sector. The economic, social and environmental returns from forest investments justify public GoE expenditure and international investments in the sector. Public finance is required for a programmatic development of the enabling environment, including the human capacity and technology and to leverage community and private sector investments.














































Catalytic finance in form of public expenditure and concessional loans in sustainable forest production and value chains as well as forests and rural development will leverage substantial private and community investments. The Ethiopian Development Bank can also provide loan finance for productive value chain investments in the forest sector. It is expected that this finance will leverage at least five times the invested amount from communities and the traditional private sector along the value chains by 2025. The Ethiopian Investment Commission can help to facilitate investments in opportunities identified by the NFSDP.

Forest environmental functions, in particular for the protection and sustainable use of biodiversity will require a higher ratio of continuous public investment, which is justified by the public goods protected and services generated. However, REDD+ and water payments should finance a substantial amount of the protection costs in the future. For urban greening and urban forests corporate social responsibility (CSR) finance can be mobilized given that the planning and maintenance is either financed by CSR or the public sector. Finally, there are a number of civil society organizations with well-established partnerships that can mobilize finance for forest sector investments.

Increasing private sector and community investment is an important component of achieving NFSDP financing targets. The development of business cases, investment materials, and demonstration examples can help to convince private sector and communities to invest in the activities supported by the NFSDP. Commercial forestry is particularly reliant on the private sector for investment. Climate-smart agriculture and FLR rely heavily on community participation.

Ethiopia has also ample experience in programmatic funding and multi-donor trust funds, e.g. related to SLMP II. There is also successful experience to leverage climate finance e.g. from the Public Program for Climate Resilience (PPCR) or the Global Environment Facility (GEF). The forest sector is already involved in a cross-sectoral proposal for the Green Climate Fund. There is significant potential to seek funding for the NFSDP (Figure 10).

Figure 10: Potential development finance partners

Development partners and banks	Total size of investments/donations/financing ²	Type of support provided			Potential relevance for revised NFSDP		
		\$					
Development Bank of Ethiopia	Large (>25MM USD)	\$					
Norad	Large (>25MM USD)	\$					
Department for International Development: Forests	Large (>25MM USD)	\$					
	Large (>25MM USD)	\$					
	Large (>25MM USD)	\$					
	Large (>25MM USD)	\$					
European Union	Medium (5-25MM USD)	\$					
Finland	Medium (5-25MM USD)	\$					
Farm Africa	Medium (5-25MM USD)	\$					
SOS SAHEL Ethiopia	Medium (5-25MM USD)	\$					
	Medium (5-25MM USD)						
FAO Fiat Panis							
GIZ							
Global Green Growth Institute							
CIFOR							
IWMI							
UNDP							

Source: NFSDP review 2016

Implementation strategy:

- Establish national and regional level forest funds under MEFCC and respective regional offices. Revenues generated from the forest sector, royalty fees and payments for ecosystem services, etc. can be collected in this fund and used for NFSDP implementation.
- Establish financing priorities based on cost & benefit analysis.
- Present NFSDP including the investment plan to the Ministry of Finance and Economic Development and development partners to understand their priorities and where they wish to provide financial support e.g. for one specific pillar or component or supporting a number of pillars in specific regional states.
- Continue the Public Private Dialogue on Forest Sector Development to remove investment barriers and attract private finance.
- Partner with the Ethiopian Development Bank to establish specific financing window for forest production and value chain investments.
- Develop business cases and investment materials to attract private sector and community investment.



Targets:

- Mobilize 25% development partner matching finance from GoE federal and regional budget until 2020 and 50% until 2025.
- Raise 75% GoE matching finance from development partner until 2020 and 50% until 2025.
- Attract 5 times the GoE and development partner finance from private sector and CSR until 2025.
- Mobilize 5 times community in-kind investment until 2025.

Risks and mitigation

The major risks to successful implementation of the NFSDP can be categorized as financial, institutional, economic and land availability related risks.

Financial risks

The required finance should be mobilized from different sources. Inadequate mobilization of the required finance will be the major risk for the implementation of the NFSDP.

Mitigation strategies:

- Proactively mobilize finance from development partners.
- Attract private finance in to the sector by creating enabling environment for forest investment.
- Strengthen public-private partnership.
- Community mobilization and ownership.
- Efficient use of the mobilized finance and creating synergies between different finance sources.
- Collaborate with the European Investment Bank to emphasize the opportunity of investments in the NFSDP.
- Collaborate with the MoFEC to maximize investments from international donors, such as the Green Climate Fund.

Institutional risk

The current institutional frameworks of the sector lack strong vertical (federal, regional) and horizontal (intersectoral) alignment, particularly at regional levels. Given the fact that most of the forest sector programs are implemented on the ground at regional levels the need for a strong lead institution with structure that cascades to the local level to mobilize relevant stakeholders and communities for the implementation of the NFSDP and Regional Forest Sector Development Programs is a key success factor. The institutional set up at the regional level should be revised and aligned to MEFC in the coming Ethiopian fiscal year. Delays in doing so will increase the risk for the implementation of the NFSDP. Further, institutional fragmentation at the federal and regional levels poses significant risks as the NFSDP requires strong inter-sectoral coordination throughout.

**Mitigation strategies:**

- Revise the current institutional set up at the regional level based on the NFSDP and the Regional Forest Sector Development Programs.
- Designate a regional level focal institution as an interim measure.
- Tap into existing multi-sectoral stakeholder platforms and establish new ones both at national and regional levels.

Capacity risks

The successful implementation of the NFSDP and subsequent Regional Forest Sector Development Programs require human, technological and material capacities at all level. Unless the capacity of implementing institutions both at federal and regional levels is built in a timely manner, it will become a risk for the implementation of the NFSDP.

Mitigation strategies:

- Need-based capacity building programs.

Economic risks

Greatly increasing the production of forest products, especially fuelwood, as proposed in the NFSDP could potentially lead to an oversupply. Should this happen, it would depress the price of fuelwood with negative effects for woodlots and other fuelwood producers.

Mitigation strategies:

- Conduct fuelwood supply and demand estimates to update obsolete figures.
- Concentrate fuelwood production in areas with high projected demand.

Land availability risks

Ethiopia is a fast growing country and its population increasingly demands suitable land for agricultural and other economic activities. The NFSDP requires significant land area in order to be successfully implemented. Historically, tension over land use planning has led to conflict between the GoE and community groups. If poorly implemented, social pressures could undermine the benefits of the NFSDP.

Mitigation strategies:

- Involve communities in land use planning.
- Incorporate stakeholder input into Regional Forest Sector Development Programs.
- Demonstrate and communicate the economic and job-creating opportunities of the NFSDP.



Social and environmental safeguards

The NFSDP will be implemented in accordance with strict social and environmental safe-guards.

Vigorous guidelines will be developed for the different NFSDP activities to mitigate direct and indirect negative impacts of NFSDP actions on communities and ecosystems. It is important to mention that a REDD+ safeguard system is being developed in the context of the national REDD+ strategy, which will screen REDD+ activities against environmental, social and governance screening criteria and redesign (when necessary) those activities to address risks and maximize benefits.

The social and environmental safeguards guidelines will include clear processes for stakeholder consultation to allow relevant stakeholders to have a voice in decision-making processes beginning at the earliest stages of planning activities and investments. These guidelines will also provide avenues for the involvement of the public, communities/landowners, proponents, private interest groups and government offices in the assessment and review of any proposed interventions. The NFSDP may also consider building on the Resettlement Policy Framework that is being developed in the context of the national REDD+ strategy. The Resettlement Policy Framework is an instrument used to compensate or replace lost assets, livelihood, and income; and assistance for relocation, including provision of relocation sites with appropriate facilities and services. Further, the NFSDP can use grievance redress mechanisms associated with the State's government system, such as Kebele, Woreda, zonal, regional and national courts and dispute resolution mechanisms, and ombudsman offices. These grievance redress mechanisms ensure that all persons are presented with procedures that value the opportunity to be heard; promote conflict resolution; encourage the development of harmonious partnerships; ensure that conflicts and grievances are mediated fairly; and are transparent and equitable.

This activity is estimated to cost USD 610,000 in consulting and workshop expenses.

Implementation approach

Based on the situation analysis phase of the NFSDP, key program pillars, action programs, specific actions, implementation strategies and targets for the identified programs are developed in the program development phase. Some of the program actions are a prerequisite for the implementation of the others due to which phasing and sequencing of program actions are required. To this end, NFSDP implementation requires two complementary approaches to ensure success: 1) enabling conditions and 2) implementation of the core action programs.



Enabling conditions

For successful implementation of the NFSDP most of the program actions indicated in the enabling environment and institutional development pillar should be implemented as soon as possible. These action programs create the enabling environment for effective and smooth implementation of the remaining core action programs. Specific actions that should be categorized under this phase include:

- Enacting the revised forest proclamation
- Approval of the draft forest regulation
- Developing relevant directives and guidelines as required
- Regional Forest Sector Development Programs
- Revising and aligning the institutional frameworks at the regional level
- Introducing and adapting of basic technologies for forest sector development such as improved seed and clonal nursery technologies
- Establishing training infrastructures, developing tailored curricula for short-term and formal training needs of the sector, etc.

As it is already the end of Year 1 of GTP 2, the above mentioned actions should be quickly implemented starting from the next fiscal year and should not take more than 1-2 years. While creating the enabling environment, the ongoing sector activities can still continue in parallel until the implementation of action programs start within the NFSDP framework.

Implementation of the core action programs

A stepwise approach is required to revitalize the forest sector, where investments are first designated to transforming the existing forest resource base and wood-based industries, followed by subsequent investments in expanding new industrial plantations after identifying ready to invest land free of land tenure conflicts. The transformation of existing state-owned plantations into intensively managed forests could serve as a good entry point. In the same way, reorienting the existing smallholder woodlots production system into commercial and value chain based development will serve as an additional source of raw material for existing wood-based industries. The development of new production forests and wood-based industries should follow the forest industry cluster approach. Moreover, action programs under the environmental services, urban greening and forests and rural livelihoods pillar should build on existing initiatives such as the national and subnational REDD+ readiness process, Biodiversity development plans and SLMP scaling up initiatives. Furthermore, prioritization of action programs that will be done in phase 3 of this study will help to give priority to the implementation of action programs with high impacts and benefits in line with finance mobilization capacity.



Monitoring, evaluation and support systems

The main objective of the monitoring and support system is to monitor and evaluate the performance of the NFSDP and Regional Forest Sector Development Programs implementation at national and regional levels. Based on the findings of the monitoring and evaluation, required supports will be provided to address gaps and barriers that hinder successful implementation of the designed sector program actions. The system follows these approaches:

- Regular reporting of the implementation of NFSDP and Regional Forest Sector Development Programs (quarterly and annual reports);
- Monitoring will disaggregate progress by gender, wealth and age categories to allow an analysis of the social equity of impacts;
- Conducting diagnostic studies, visits and supervision to validate reports on the ground, identify gaps and barriers and required supports at all levels;
- Identifying best practices, packaging them and scaling up;
- Organizing annual review workshops with federal and regional level stake-holders to evaluate progress and give guidance on subsequent annual operational plans;
- Providing required supports that address the identified gaps and barriers based on the data generated from regular reports, studies and site visits;
- Feeding lessons learnt through the implementation process of the NFSDP into evidence and need based sector policy, legal and institutional frameworks revisions;
- Disaggregating according to gender, age, income categories (to the extent possible).

Implementation strategy:

It is believed that the implementation of the NFSDP and subsequent Regional Forest Sector Development Programs will be taken up by relevant functional structures within MEFC and lead regional institutions. However there is a need to establish or designate dedicated monitoring units at all levels to track the implementation progress, identify best practices and challenges and provide the required backstopping. This activity is estimated to cost USD 390,000 in consulting and workshop expenses.



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Policies and legal documents reviewed:

Ethiopian Constitution (1995)

Forest Policy (2007)

Forest Conservation and Utilization Proclamation (2007)

Federal Rural Land Administration and Land Use Proclamation (2005)

Federal Investment Proclamation (2012)

Environmental Impact Assessment Proclamation (2002)

Energy Proclamation (2013)

Environmental Policy (1997)

Agricultural Development-led Industrialization (ADLI) Strategy (1993)

Plan for Accelerated and Sustainable Development to End Poverty (PASDEP) (2006-2011)

Development, Conservation and Utilization of Wildlife (Proclamation No. 541/2007)

Access to Genetic Resources and Community Knowledge, and Community Rights
(Proclamation No. 482 /2006)

Ethiopian Water Resources Management (Proclamation No. 197/2000)

Guideline for Participatory Forest Management in Ethiopia (2012)

Oromia Rural Land Use and Administration Proclamation (2007)

Annex

Annex 1: Implementation targets and timeline for all NFSDP pillars

Enabling environment and institutional development

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution
					GTP 2					GTP 2						
					1	2	3	4	5	6	7	8	9	10		
Pillar 1: Enabling environment	1.1.1. Enacting the revised forest law/proclamation	No	1	1	1										0	MEFCC
	1.1.2. Approval of forest regulation	No	1	1	1										0	MEFCC
	1.1.3. Approval of relevant directives, manuals and standards ²⁸	No	18	8	2	2	2	2	2	2	2	2	2	2	10	MEFCC
	1.1.4. Review implementation of the forest policy, strategy and proclamation	No	2	1											1	MEFCC
1.2. Forest sector institutional framework from Federal to Regional levels	1.2.1. Support regional institutional strengthening and development of Regional Forest Action Plans	No	11	11	11										0	MEFCC & Regional States
	1.2.2. Mobilizing the existing multi-stakeholder platforms at federal levels to enhance intersectoral coordination, particularly the CRGE steering committee	No	9	4	1	1	1	1	1	1	1	1	1	1	5	MoFEC & MEFCC
	1.2.3. Forest information management system in place	No	1	1	1										1 ²⁹	MEFCC & Regional States
	1.2.4. Establish one forest safety division with two branches ³⁰	No	1	1		1										MEFCC
1.3. Revising the National GDP accounting system related to the forest sector	Revising the national GDP accounting system related to forestry and valuation of the contribution of the forest sector to the national GDP	No	1	1		1									0	MEFCC & MoFEC
1.4. Human capacity development	1.4.1. TVET tailored forestry extension agent (DA) training ³¹	No	9,000 ³²	4,500											4,500	MEFCC
	1.4.2. Tailored university forestry education ³³	No	5,000 ³⁴	2,500											2,500	MEFCC & Universities
	1.4.3. Public forest training centers	No	9 ³⁵	9	1	3	3	2							0	MEFCC

28 A directive, manuals or standards can be delivered for woodlot management, commercial plantation establishment and management, bamboo, transfer of forest products, fire and pests, MRV system, bene-fit sharing mechanism, nursery standard, seed manual role of non-state actors, gum and resin, and issues identified under 2.1.3.

29 This target refers to the same forest information management system. In other words, there is only one information system that should be established.

30 The two branches need to be located systematically in regions (areas) with frequent forest fire or known forest related hazards. Research should guide the location of the two branches. The headquarter (the main office) will be located in Addis and should be equipped with heavy firefighting equipment such as helicopter and a forest safety warning system, while the branches require less equipment but that sufficient for emergency responses as well as surveillances.

31 A regional survey is currently being conducted to determine the exact amount of expertise which is required. Thus, the target numbers may be further refined.

32 This is rough training of about 900 forestry extension agents per year. This can be achieved if 3 TVET colleges per region with 40 student intake per year provide forest rangers training in five to six regional states with good forestry development potential. Student intake per year can be adjusted based on regional needs and forest development potential. A curriculum that focuses on practical forestry training should be developed by bench marking best performing countries. Trainers or teachers with sufficient field or industry experiences should be recruited to train the rangers. In the meantime, NRM extension agents can be provided with refresher training in practical forestry to fill current gaps.

33 A regional survey is currently being conducted to determine the exact amount of expertise which is required. Thus, the target numbers may be further refined.

34 Based on recent studies in the forest sector of Ethiopia (FSR, 2015 and IFC, 2016), the commercial forest development proposed in the NFSDP requires nearly 3,000 professional personnel for forest re-source base development and about 2,000 in forest industries to provide the required technical, managerial and leadership services. This means a total of 5,000 trained forestry personnel are needed in the coming 10 years, approximately 500 per year. This is also excluding experts needed in research, academic and government offices. The program development and actual training can be done in the four selected universities based on a clear agreement with MEFCC, this will be 130 student intake or graduation every year in two to three programs such as silviculture, forest industry, forest economics and marketing.

35 One such training center should be established in each regional state, at least in the regions with high forest development potential such as Oromia, Amhara, and SNNPR, Gambella and Benishangul and Tigray.



Enabling environment and institutional development (continued)

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution	
					GTP 2					GTP 2							
					1	2	3	4	5	6	7	8	9	10			
1.5. Technology development	1.5.1. Improving research capability of EEFRI (or its centers) through modern laboratories	No	2	1			1									1	EEFRI
	1.5.2. Clonal nursery and greenhouse technology development	No	2	2			1	1								0	MEFCC & EEFRI
	1.5.3. Establish forest seed orchards around the already established seed centers in 4 regions ³⁶	No	4	4	2	2										0	EEFRI
	1.5.4. Establish research extension linkage demonstration field sites ³⁷	No	10	5												5	EEFRI

Sustainable forest production and value chain

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution
					GTP 2					GTP 2						
					1	2	3	4	5	6	7	8	9	10		
2.1. Establishing new commercial plantations	2.1.1. Private commercial forest plantation development	ha (1,000)	50	20	5	5	5	5	5	6	6	6	6	6	30	Private sector
	2.1.2. Commercial forest plantation development by state enterprises	ha (1,000)	150	60	15	15	15	15	18	8	18	18	8	90	State Forest Enterprises	
	2.1.3 Organized smallholders commercial plantation or woodlots development	ha (1,000)	150	100	25	25	25	25	20	20	20	20	20	100	MEFCC & Regional States	
2.2. Improved management of existing public industrial plantations	2.2.1. Establish joint venture (PPP) to improve management	ha (1,000)	70	20		5	5	10	10	10	10	10	10	50	State Forest Enterprises & private sector	
	2.2.2. Improved management through public forest enterprises	ha (1,000)	110	60		10	10	20	10	10	10	10	10	50	State Forest Enterprises	
2.3. Improved commercial management of natural high forests	2.2.1. Establish joint venture (PPP) to improve management	ha (million)	0.75	0.1			.05	.05	.15	.10	.20	.10	0.65	MEFCC & Regional States		
	2.3.2. Improved management through public forest enterprises	ha (million)	0.75	0.1			.05	.05	.15	.10	.20	.10	0.65	State Forest Enterprises		

³⁶ Ethiopia will need at least four seed orchards around the four seed centers established in the country recently and two commercial high standard nurseries, with the annual production capacity of at least 30-40 million seedlings. Two such nurseries, equipped with state-of-the-art commercial nursery technologies are needed to support the scale of forest development Ethiopia wants to achieve.

³⁷ Data/information sharing and repository system and about 10 permanent forestry research field sites distributed across various agro-ecology of the country to demonstrate best practices.

Sustainable forest production and value chain (continued)

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution
					GTP 2					GTP 2						
					1	2	3	4	5	6	7	8	9	10		
2.4. NTFPs development and commercialization	Commercialization through value chain of 3 NTFP (gum and resin, honey and beeswax, forest coffee)	No	3	3	3	3	3	3	3	3	3	3	3	3	3	MEFCC & Regional States
2.5. Improved management of highland and lowland bamboo resources	2.5.1. Sustainable management of bamboo resources and value chain development	ha (1,000)	400	100	25	25	25	25	60	60	60	60	60	300	MEFCC & Regional States	
	2.5.2. Establish new bamboo plantations	ha (1,000)	200	50										150	MEFCC & Regional States	
2.6. Forest industry cluster development	2.6.1. Establish wood industry cluster	No	2	1		1				1				1	MEFCC & Mol	
	2.6.2. Promote modern timber products and the use of harvested wood products to store carbon and substitute emission intensive products	√	√	√										√	MEFCC & Construction Ministry	

Forest environmental functions

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution
					GTP 2					GTP 2						
					1	2	3	4	5	6	7	8	9	10		
3.1. Forest ecosystem services	3.1.1. Climate change mitigation (Emission reduction through REDD+ and AR programs) ³⁸	tons of CO ₂	147 Mt CO ₂ e	20%											65	MEFCC
	3.1.2. Watershed protection program (water based PES schemes)	No	7	2			1	1	1	1	1	1	1	5	MoWIE	
3.2. Forest biodiversity conservation development	3.2.1 Forest protected areas/Biosphere reserves development	%	20%	17%										20%	IBC	
	3.2.2. Management and establishment of NFPA, Protected areas and biosphere reserves	% ³⁹	70%	30%										40%	MEFCC	
	3.2.4. Establish botanical gardens	No	7	4	1	1	1	1	1	1	1			3	EBI & MoUDH	
3.3 Forest Landscape Restoration	Forest Landscape Restoration	ha	15 mil	15 mil	1	1	1	1	1	2	2	2	2	10 mil	MEFCC	

³⁸ REDD+ activities leading to the planned emission reductions:

6. Implementation of PFM
7. AR on 3 million hectares as indicated in the CRGE
8. Sustainable Management of forests (4 million hectares of high forests and woodlands)
9. Distribution of cookstoves (note this overlaps with rural livelihoods pillar)
10. Climate smart agriculture

³⁹ Target refers to mapping, demarcation and gazettement of existing high forests.



Forest and rural livelihoods

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution	
					GTP 2					GTP 2							
					1	2	3	4	5	6	7	8	9	10			
4.1. Purposeful tree planting activities in the rural landscape	Promoting and developing woodlots and agroforestry	ha	10 mill	5 mill												5 mill	MEFCC & MoANR
4.2. Mapping and enhancing sustainable management of village forests	Scaling up PFM implementation to scattered village forests/area closures	%	100%	50%												50%	MEFCC
4.3. Support the development of forest based community enterprises	Develop entrepreneurship skills and supporting business start-ups of small and medium forest based enterprises	No	5,000	2,500												2,500	MEFCC & FMSEDA
4.4. Formation and strengthening of community based organizations	Establishing and supporting national level Apex community organization	No	1	1			1										MEFCC
4.5. Rural Energy Development	4.5.1. Improved and sustainable charcoal production from agriculture and forest by products	No ⁴⁰	5,000	2,000												3,000	MEFCC
	4.5.2. Scaling up the use and distribution of improved cook stoves	No ⁴¹	17.1 million	11.4 million ⁴²												5.7 million	MEFCC

Urban greening and urban forests

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution	
					GTP 2					GTP 2							
					1	2	3	4	5	6	7	8	9	10			
5.1. Urban greening	5.1.1. Infrastructure development for green areas	No	11	7		1	2	2	2	2	2					4	MEFCC & MoUDH
	5.1.2. Implementing urban greening guidelines for species selection, planting and management of trees	No	11	7		1	2	2	2	2	2					4	MEFCC & MoUDH
5.2. Urban forest development	5.2.1. Develop management plan for urban forests in 11 regional cities	No	11	7		1	2	2	2	2	2					4	MEFCC & MoUDH
	5.2.2. Establish recreational facilities and infrastructures in urban forests and green areas	No	11	7		1	2	2	2	2	2					4	MEFCC & MoUDH

40 Number of Kebeles where improved charcoal kilns have been promoted.

41 Number of fuel-efficient cookstoves distributed and in use.

42 GTP 2 Targets of MEFCC and I assumed 50% of that for GTP 3 assuming rural electrification will reach most Kebeles by this time.



Implementation framework

Action Program Pillar	Action Area	Unit	10 year Target	GTP 2 Targets	10 year Implementation Timeline										GTP 3 Targets	Responsible Institution	
					GTP 2					GTP 2							
					1	2	3	4	5	6	7	8	9	10			
6.1. Assumptions	6.1.1. High political ambition for green economy	✓	✓	✓												✓	MEFCC
	6.1.2. Strategic communication plan	✓	✓	✓												✓	MEFCC
6.2. Finance	Targets will be established in phase 3																
6.3. Risks and mitigation	Implementing risk mitigation strategies	✓	✓	✓												✓	MEFCC
6.4. Social and environmental safeguards	Implementing social and environmental safeguards	✓	✓	✓												✓	MEFCC
6.5. Implementation approach	Implementation approach	✓	✓	✓												✓	MEFCC
6.6. Monitoring, evaluation and support systems	6.6.1. Implementing M & E and support systems	✓	✓	✓												✓	MEFCC
	6.6.2. Forest sector development program performance review	No	9	4		1	1	1	1	1	1	1	1	1		5	MEFCC

Annex 2: CBA Assumptions

Cross-cutting

Financial variables		
Discount rate	5%	Long-term Ethiopia average
Labor variables		
Farm labor per day	\$2	MEFCC 2015 Forest Sector Review
Jobs per hectare, plantations	0.10	MEFCC 2015 Forest Sector Review
Jobs per hectare, PFM, conservation	0.01	REDD+ Oromia
Ethiopian Government staff time	15%	Consultant estimate, Africa
Environmental variables		
Price ton CO ₂	\$5	
Soil erosion value per hectare, natural forest	\$49	UNDP 2016
Carbon stock improved management of natural forest CO ₂ /ha	238	MEFCC 2015

Pillar 1 costs

1.1.1 Enacting the revised forest law/proclamation		
Consulting costs	\$30,000	Consultant estimate, Ethiopia
1.1.2 Approval of forest regulation		
Consulting costs	\$30,000	Consultant estimate, Ethiopia
1.1.3 Approval of relevant directives, manuals and standards		
Consulting costs	\$30,000	Consultant estimate, Ethiopia
Workshop	\$10,000	Consultant estimate, Ethiopia
1.1.4 Review implementation of the forest policy, strategy and proclamation		
No cost	-	Consultant estimate, Ethiopia
1.2.1 Forest information management system in place		
Workshop	\$10,000	Consultant estimate, Ethiopia
1.2.2 Supporting development of Regional Forest Action Plans		
Consulting costs	\$540,000	Consultant estimate, Ethiopia
1.2.3 Mobilizing existing multi-stakeholder platforms at federal levels to enhance intersectoral coordination		
Consulting costs	\$240,000	Consultant estimate, Ethiopia
Workshop	\$10,000	Consultant estimate, Ethiopia
1.3 Revising the national GDP accounting system		
Consulting costs	\$120,000	Consultant estimate, Ethiopia
Workshop	\$10,000	Consultant estimate, Ethiopia
1.4 Establish one forest safety division with two branches		
Annual rent	\$90,000	Consultant estimate, Ethiopia
Equipment for headquarters and two branches, including helicopter, trucks, gear	\$4,000,000	Consultant estimate, Ethiopia
1.5.1 TVET tailored forestry/NRM extension agent training		
Curriculum development, training, etc.	\$1,350,000	External expert estimate
1.5.2 Tailored college forestry education		
Materials and equipment per training center	\$1,000,000	External expert estimate
1.6.1 Improving research capability of EEFRI and its centers through modern laboratories (at least two modern labs)		
Cost per lab, including greenhouses, chemistry research facility, physiology laboratory, field plantations, biotechnology and tree genetic laboratories	\$3,000,000	External expert estimate
1.6.2 Clonal nursery and greenhouse technology development		
Cost per nursery	\$1,200,000	External expert estimate
1.6.3 Establish forest seed orchards around the already established seed centers in 4 regions		
Cost per seed orchard	\$200,000	External expert estimate
1.6.4 Establish research extension linkage demonstration field sites		
Cost per demonstration site	\$5,000	External expert estimate

Pillar 2 costs and revenues

2.1.1, 2.1.2, and 2.1.3 Establishing commercial plantations		
Production costs		
Project management	\$100	MoANR SLMP II PIM
Full planting cost per ha	\$54	MoANR SLMP II PIM
No. of seedlings per ha	\$1,111	MoANR SLMP II PIM
Cost per seedling	\$0.2	MoANR SLMP II PIM
Weeding per ha - till Year 3	\$32	MoANR SLMP II PIM
Pruning per ha	\$30	MoANR SLMP II PIM
Thinning per ha	\$30	MoANR SLMP II PIM
Patrol/monitoring, fire protection cost per ha/ year	\$5	MoANR SLMP II PIM
Planting investment	\$700	MoANR SLMP II PIM
Extraction costs		
Annual increment - planted stands (m ³ /ha/year)	22	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 4 - planted stand	10	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 6 - planted stand	23	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 9 - planted stand	38	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 13 - planted stand	42	Adapted from Moges et al., 2010
Roundwood harvest cost per m ³ (USD)	\$15	Adapted from Moges et al., 2010
Fuelwood harvest cost per m ³ (USD)	\$5	Adapted from Moges et al., 2010
Price variables		
Price per m ³ of roundwood (logs)	\$39	Adapted from Moges et al., 2010
Price per m ³ of fuelwood	\$21.5	Adapted from Moges et al., 2010
Carbon variables		
Baseline carbon stocks (tCO ₂ /ha)	4.7	WBISPP 2004 unstocked grassland
Biomass expansion factor	2.0	Table 3A.1.10 GPG IPCC 2003
Average wood density	0.5	Table 3A.1.10 GPG IPCC 2003
Root to shoot ratio	0.3	Table 3A.1.10 GPG IPCC 2003
C to CO ₂ conversion	3.7	
2.2.1 and 2.2.2 Improved management of existing public industrial plantations		
Production costs		
Boundary demarcation/maintenance cost per ha/year	\$4	MOANR SLMP II PIM
Pruning, thinning, climber cutting, etc. per ha	\$40	MOANR SLMP II PIM
Forest protection cost per ha/year	\$3	Reichhuber & Requate 2006
Cost of establishing PFM institution	\$45	External expert estimate
Surveying, mapping etc.	\$10	MOANR SLMP II PIM
Extraction costs		
Improved annual increment - (m ³ /ha/year)	5.7	Moges et al. 2010
m ³ fuelwood harvested per ha - starting Year 2	2	MoANR SLMP II PIM
m ³ roundwood (logs) harvested per ha - starting Year 2	0.3	MoANR SLMP II PIM
Roundwood harvest cost per m ³	\$15	MoANR SLMP II PIM
Fuelwood harvest cost per m ³	\$0.0	MoANR SLMP II PIM
Price variables		
Price per m ³ of roundwood (logs)	\$80.0	Bekele 2011
Price per m ³ of fuelwood	\$12.6	MoANR SLMP II PIM
Carbon variables		
Baseline carbon stocks (tCO ₂ /ha)	73	WSIPP 2004
Biomass expansion factor	2.0	IPCC 2003
Average wood density	0.5	IPCC 2003
Root to shoot ratio	0.3	IPCC 2003
C to CO ₂ conversion	3.7	

Pillar 2 costs and revenues (continued)

2.3 Improved commercial management of natural high forests		
Labor and materials per hectare	\$30	Consultant estimate, Africa
Fuelwood (NPV)	\$58	Consultant estimate, Africa
Roundwood (NPV)	\$44	Consultant estimate, Africa
NTPFs (NPV)	\$32	Consultant estimate, Africa
Carbon benefits (NPV)	\$149	Consultant estimate, Africa
Soil erosion benefits (NPV)	\$54	Consultant estimate, Africa
2.4.1 Sustainable management of gum & resin resources and value chain development		
Cost per association	\$25,000	Consultant estimate, Ethiopia
2.4.2 Support commercial production of honey		
Cost per association	\$25,000	Consultant estimate, Ethiopia
2.5 Improved management of highland and lowland bamboo resources		
Production costs		
Boundary demarcation/maintenance cost per ha/year	\$4	MoANR SLMP II PIM
Pruning, thinning, climber cutting, etc. per ha	\$40	MoANR SLMP II PIM
Forest protection cost per ha/year	\$3	Reichhuber & Requate 2006
Cost of establishing PFM institution	\$45	MoANR SLMP II PIM
Surveying, mapping etc.	\$10	MoANR SLMP II PIM
Extraction costs		
Annual increment - (m ³ /ha/year)	5.7	Moges et al. 2010
m ³ fuelwood harvested per ha - starting Year 2	2.0	MoANR SLMP II PIM
m ³ roundwood (logs) harvested per ha - starting Year 2	0.3	MoANR SLMP II PIM
Roundwood harvest cost per m ³	\$15.0	MoANR SLMP II PIM
Fuelwood harvest cost per m ³	\$0.0	MoANR SLMP II PIM
Price variables		
Price per m ³ of roundwood (logs)	\$80.0	Bekele, 2011
Price per m ³ of fuelwood	\$12.6	MoANR SLMP II PIM
Carbon variables		
Baseline carbon stocks (tCO ₂ /ha)	73	WSIPP 2004
Biomass expansion factor	2.0	IPCC 2003
Average wood density	0.5	IPCC 2003
Root to shoot ratio	0.3	IPCC 2003
C to CO ₂ conversion	3.7	
2.5 Bamboo plantation establishment		
Production costs		
Project management	\$100.0	MoANR SLMP II PIM
Full planting cost per ha	\$54.0	MoANR SLMP II PIM
No. of seedlings per ha	\$1,111.0	MoANR SLMP II PIM
Cost per seedling	\$0.2	MoANR SLMP II PIM
Weeding per ha - till Year 3	\$32.0	MoANR SLMP II PIM
Pruning per ha	\$30.0	MoANR SLMP II PIM
Thinning per ha	\$30.0	MoANR SLMP II PIM
Patrol/monitoring, fire protection cost per ha/year	\$5.0	MoANR SLMP II PIM
Planting investment	\$700.0	MoANR SLMP II PIM

Pillar 2 costs and revenues (continued)

Extraction costs		
Annual increment - planted stands (m ³ /ha/year)	22.0	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 4 - planted stand	10.0	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 6 - planted stand	23.0	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 9 - planted stand	38.0	Adapted from Moges et al., 2010
m ³ thinning per ha at Year 13 - planted stand	42.0	Adapted from Moges et al., 2010
Roundwood harvest cost per m ³ (USD)	\$15.0	Adapted from Moges et al., 2010
Fuelwood harvest cost per m ³ (USD)	\$5.0	Adapted from Moges et al., 2010
Price variables		
Price per m ³ of roundwood (logs)	\$39.0	Based on Moges et al., 2010
Price per m ³ of fuelwood	\$21.5	Based on Moges et al., 2010
Carbon variables		
Baseline carbon stocks (tCO ₂ /ha)	4.7	Taken from WBISPP 2004 unstocked grassland
Biomass expansion factor	2.0	Table 3A.1.10 GPG IPCC 2003
Average wood density	0.5	Table 3A.1.10 GPG IPCC 2003
Root to shoot ratio	0.3	Table 3A.1.10 GPG IPCC 2003
C to CO ₂ conversion	3.7	
2.6.1 Establish clusters		
Saw mill (50,000 m ³ capacity)	\$10,000,000	IFC 2016
Panel mill (200,000 m ³ capacity)	\$90,000,000	IFC 2016
2.6.2 Developing and supporting small and medium scale forest enterprises within the industrial clusters		
Business start-up grants per business	\$20,000	Consultant estimate, Ethiopia

Pillar 3 costs and revenues

3.1.1 Climate change mitigation REDD+: Participatory Forest Management		
Labor and materials per hectare	\$30	Consultant estimate, Africa
Fuelwood (NPV)	\$58	Consultant estimate, Africa
Roundwood (NPV)	\$44	Consultant estimate, Africa
NTFPs (NPV)	\$32	Consultant estimate, Africa
Carbon benefits (NPV)	\$149	Consultant estimate, Africa
Soil erosion benefits (NPV)	\$54	Consultant estimate, Africa
3.1.1 Climate change mitigation REDD+: Afforestation and reforestation		
Establishment		
Boundary maintenance	\$0.7	MoANR SLMP II PIM
Enrichment planting cost per ha (USD/ha)	\$6	MoANR SLMP II PIM
No. of seedlings - enrichment planting per ha	100	MoANR SLMP II PIM
Cost per seedling (USD)	\$0.2	MoANR SLMP II PIM
Pruning, thinning, de-coppicing, etc. cost per ha (USD)	\$20	MoANR SLMP II PIM
Patrol/monitoring, fire protection cost per ha/ year (USD)	\$5	MoANR SLMP II PIM
Annual increment (m ³ /ha/year)	1.3	MoANR SLMP II PIM
Carbon component		
Baseline carbon stocks (tCO ₂ /ha)	12.8	MoANR SLMP II PIM
Biomass expansion factor	3.4	IPCC 2003
Average wood density	0.5	IPCC 2003
Root to shoot ratio	0.27	IPCC 2003

Pillar 3 costs and revenues (continued)

3.1.1 Climate change mitigation REDD+: Distribution of cook stoves		
Consumption		
Rural household ratio	0.85	MoANR SLMP II PIM
Urban household ratio	0.15	MoANR SLMP II PIM
Rural annual fuelwood consumption t/per capita/year	0.88	Zebeke 2010
Urban annual fuelwood consumption t/per capita/year	0.88	Zebeke 2010
Rural annual fuelwood consumption t/household per year	4.59	Statistic office, Ethiopia 2007
Urban annual fuelwood consumption t/household per year	4.23	Statistic office, Ethiopia 2007
Non-renewable biomass ratio of total Ethiopia consumption	0.88	DNA Ethiopia, 2012
Rural non-renewable biomass consumption per household	4.04	MoANR SLMP II PIM
- baseline t/biomass/household/year		
Urban non-renewable biomass consumption per household	3.73	MoANR SLMP II PIM
- baseline t/biomass/household/year		
Each household cookstove purchases per 3 years	2	MoANR SLMP II PIM
ICS fuel savings per year t/biomass (oven dry)	0.7	Based on Bluffstone, 2014; EUEI PDF 2013
Household fuel saving per year t/biomass (oven dry)	1.4	Bluffstone, 2014; EUEI PDF 2013
Household savings of non-renewable biomass t/biomass (oven dry)/year	1.2	Bluffstone, 2014; EUEI PDF 2013
Conversion over dry biomass to m ³ freshly harvested Eucalyptus m ³ freshly harvested/1 ton of biomass	1.6	Bluffstone, 2014; EUEI PDF 2013
Household savings of non-renewable woody biomass m ³ /household per year	1.9	Bluffstone, 2014; EUEI PDF 2013
Lifetime of one ICS years	3	MoANR SLMP II PIM
Demand non-renewable biomass rural household with efficient ICS t/biomass (oven dry)	2.84	MoANR SLMP II PIM
Demand non-renewable urban household with efficient ICS t/biomass (oven dry)	2.53	MoANR SLMP II PIM
Demand non-renewable biomass rural household with efficient ICS m ³ /household /year	4.54	MoANR SLMP II PIM
Demand non-renewable urban household with efficient ICS m ³ /household /year	4.05	MoANR SLMP II PIM
GHG emissions savings/reduction per household tCO ₂ /household/year	2.19	MoANR SLMP II PIM
Investment costs (Woreda level)		
ICS enterprise establishment and training	\$10,000	MoANR SLMP II PIM
Establishment production line for ICS ICS/year/production facility (in Year 1, 50% production capacity achieved)	\$10,000	MoANR SLMP II PIM
Production capacity per year	4500	MoANR SLMP II PIM
Cost per household	\$18	MoANR SLMP II PIM
Recurrent costs		
Labor input per stove hours/stove	5.2	Based on Ecoact, Kai data
Labor cost per day USD/man day	5	Based on Ecoact, Kai data
Production cookstove USD	\$3.3	Based on Ecoact, Kai data
Investment for material per cookstove	\$2.5	Based on Ecoact, Kai data
Total production costs	\$5.8	MoANR SLMP II PIM
Average distribution cost per ICS	\$3.0	MoANR SLMP II PIM
Governance management and monitoring	\$3.0	MoANR SLMP II PIM
Total ICS delivered price (at local market)	\$11.8	MoANR SLMP II PIM
Sale price ICS	\$6.0	MoANR SLMP II PIM

Pillar 3 costs and revenues (continued)

3.1.1 Climate change mitigation REDD+: climate-smart agriculture		
Costs		
Cost for 50 agroforestry seedlings per ha	\$10.0	MoANR SLMP II PIM
Annual labor input	\$140.0	MoANR SLMP II PIM
Fertilizers cost per ha per year (USD/ha/year)	\$25.0	MoANR SLMP II PIM
Tools/implements (USD/ha/year)	\$0.8	MoANR SLMP II PIM
Seed cost per ha - teff - 50kg/ha	\$21.8	Minten et al., 2013. and ATA, 2014
Seed cost per ha - maize - 25kg/ha	\$5.8	Benson et al., 2013: Direct Seed Marketing Program in Ethiopia in 2013.
Seed cost per ha - wheat - 50kg/ha	\$21.0	IFPRI, 2014. IFPRI evaluates a new wheat package rollout in Ethiopia
Seed cost per ha - sorghum - 29kg/ha	\$7.4	Minot and Sawyer, 2013. Agricultural production in Ethiopia: Results of the 2012 ATA Baseline Survey 2012 ATA Baseline Survey
Seed cost per ha - pulses - 100kg/ha	\$46.2	Minot and Sawyer, 2013. Agricultural production in Ethiopia: Results of the 2012 ATA Baseline Survey 2012 ATA Baseline Survey
Productivity		
Annual base yield of teff (tons/ha/year)	1.3	Based on Agricultural Transformation Agency estimate
Annual base yield of maize (tons/ha/year)	2.5	Based on Agricultural Transformation Agency estimate
Annual base yield of wheat (tons/ha/year)	1.49	Based on Berhane et al., 2011. AGP Baseline Report 2011
Annual base yield of sorghum (tons/ha/year)	2.1	Based on CSA, 2012. Agricultural Sample Survey 2012/2013
Annual base yield of pulses (tons/ha/year)	1.2	Based on IFPRI, 2010. Pulses Value Chain Potential in Ethiopia.
Annual rate of yield increase (%)	8%	MoANR SLMP II PIM
Prices		
Base price of <i>teff</i> per ton (USD/ton)	\$430.0	Based on interviews with Woreda 2014
Base price of maize per ton (USD/ton)	\$230.0	Based on interviews with Woreda 2014
Base price of wheat per ton (USD/ton)	\$420.0	Based on interviews with Woreda 2014
Base price of sorghum per ton (USD/ton)	\$250.0	Based on interviews with Woreda 2014
Base price of pulses per ton (USD/ton)	\$460.0	Based on interviews with Woreda 2014
Carbon		
Emission reduction potential (assumes cropland in maize) (tCO ₂ /ha/year)	2	MoANR SLMP II PIM
Emission reduction potential in boundary planting (tCO ₂ /ha/year)	1	MoANR SLMP II PIM
3.1.2 Watershed protection		
Consulting costs	\$840,000	Consultant estimate, Ethiopia

Pillar 3 costs and revenues (continued)

3.2.1 Forest protected areas/biosphere reserves development program		
Protected Areas		
Gap analysis of existing Protected Areas and propose new PAs	\$6,545	External expert estimate
Validation workshop – gap analysis	\$40,909	External expert estimate
Community awareness (per PA)	\$1,364	External expert estimate
Draft legal instruments (per PA)	\$218	External expert estimate
Validation workshop (per PA)	\$2,727	External expert estimate
Employee staff (per PA)	\$81,818	External expert estimate
Office establishment (per PA)	\$454,546	External expert estimate
Biosphere reserves		
Assess potential areas for biosphere reserve	\$272,727	External expert estimate
Preparation of nomination document and apply for UNESCO	\$136,364	External expert estimate
Community awareness and demarcation	\$32,727	External expert estimate
Develop ecosystem based management plan (per reserve)	\$34,091	External expert estimate
Draft legal instruments (per reserve)	\$545	External expert estimate
Validation workshop (per reserve)	\$6,818	External expert estimate
Employee staff (per reserve)	\$81,818	External expert estimate
Office establishment (per reserve)	\$454,545	External expert estimate
3.2.2 Forest biodiversity sustainable use program		
NTFP marketing promotion and certification	\$349,090	External expert estimate
Tourism	\$174,540	External expert estimate
Bio-prospecting	\$4,954,540	External expert estimate
Biodiversity valuation	\$3,963,630	External expert estimate
Ex-situ conservation and utilization of genetic resources	\$3,963,630	External expert estimate
3.2.3 Botanical gardens		
Consulting costs	\$200,000	Consultant estimate, Ethiopia
Site selection	\$25,455	External expert estimate
Compensation (per garden)	\$1,363,636	External expert estimate
Design (per garden)	\$22,727	External expert estimate
Offices (per garden)	\$454,545	External expert estimate
Recreational facilities (per garden)	\$454,545	External expert estimate
Children playing grounds (per garden)	\$45,455	External expert estimate
Adult playing grounds (per garden)	\$45,455	External expert estimate
Seed collection (per garden)	\$10,909	External expert estimate
Seedling production (per garden)	\$32	External expert estimate
Planting (per garden)	\$32	External expert estimate
Management (per garden)	\$227	External expert estimate
3.3 Forest and Landscape Restoration		
Establishment, pruning, thinning, etc. per hectare	\$87	MoANR SLMP II PIM
Annual increment - natural stands (m ³ /ha/year)	1	MoANR SLMP II PIM
Baseline carbon stocks (tCO ₂ /ha)	12.8	Humbo ANR project
Biomass expansion factor	3.4	IPCC 2003
Average wood density	0.5	IPCC 2003
Root to shoot ratio	0.27	IPCC 2003

Pillar 4 costs and revenues

4.1.1 Purposeful tree planting to enhance the role of trees in the landscape		
Biomass production and extraction		
Seedlings full planting per ha	1,111	MoANR SLMP II PIM
Annual growth rate 1st rotation (m ³ /ha/year)	17.5	Moges et al., 2010
Annual growth rate 2 rotation after coppicing (m ³ /ha/year)	14	MoANR SLMP II PIM
Annual growth rate 3 rotation after coppicing (m ³ /ha/year)	10.5	MoANR SLMP II PIM
Base yield - m ³ of fuelwood harvested from thinning per ha at age 6	94.5	MoANR SLMP II PIM
Base yield - m ³ of fuelwood harvested from thinning per ha at age 12	75.6	MoANR SLMP II PIM
Base yield - m ³ of fuelwood harvested from thinning per ha at age 18	56.7	MoANR SLMP II PIM
Woodlot input data		
Protection from animals and fire - cost per ha/year (USD)	\$5	MoANR SLMP II PIM
Labor cost: planting per ha	\$54	MoANR SLMP II PIM
Weeding labor cost per ha	\$16	MoANR SLMP II PIM
Fuelwood harvest per USD/m ³	\$5	MoANR SLMP II PIM
Miscellaneous (15%)	15.0%	MoANR SLMP II PIM
Price variables		
Price per m ³ of fuelwood	\$16.5	Based on Moges et al., 2010
Cost per tree seedling	\$0.2	MoANR SLMP II PIM
Carbon variables		
Baseline carbon stocks (tCO ₂ /ha)	4.7	WBISPP 2004
Biomass expansion factor	2	IPCC 2003
Average wood density	0.5	IPCC 2003
Root to shoot ratio	0.24	IPCC 2003
4.2.1 Mapping and enhancing sustainable management of village forests		
Consulting/training costs	\$1,200,000	Consultant estimate, Ethiopia
4.3.1 Supporting the development of tree and forest based enterprises		
Consulting/training costs	\$1,200,000	Consultant estimate, Ethiopia
Business start-up grants per business	\$20,000	Consultant estimate, Ethiopia
4.4.1 Formation and strengthening of farmer and community organization for forest sector intervention		
Consulting/training costs	\$600,000	Consultant estimate, Ethiopia
4.5 Rural energy development program		
Costs included in 3.1 above		



Pillar 5 costs

5.1.1 Infrastructure development for green areas		
Labor and construction costs (per city)	\$727,272	External expert estimate
5.2.1 Develop management guidelines for urban forests in 11 regional cities		
Consulting costs	\$144,000	Consultant estimate, Ethiopia
5.2.2 Establishing recreational facilities and infrastructure in urban forests		
Forest offices (per city)	\$181,818	External expert estimate
Recreational facilities (per city)	\$181,818	External expert estimate
Children playing grounds (per city)	\$181,818	External expert estimate
Adult playing grounds (per city)	\$181,818	External expert estimate

Pillar 6 costs

6.1 Assumptions		
No cost	-	Consultant estimate, Ethiopia
6.2 Finance		
No cost	-	Consultant estimate, Ethiopia
Workshop	\$10,000	Consultant estimate, Ethiopia
6.3 Seek financing partners		
Consulting costs	\$300,000	Consultant estimate, Ethiopia
Workshop	\$10,000	Consultant estimate, Ethiopia
6.4 Developing and implementing safeguards		
Consulting costs	\$600,000	Consultant estimate, Ethiopia
Workshop	\$10,000	Consultant estimate, Ethiopia
6.5 Implementation Approach		
No cost	-	Consultant estimate, Ethiopia
6.6 Monitoring and evaluation		
Consulting costs	\$300,000	Consultant estimate, Ethiopia
Workshops	\$90,000	Consultant estimate, Ethiopia



Annex 3: Proposed Multi-stakeholder platforms in implementing NFSDP

Institution	Institution
The CRGE Platform	
Ministry of Finance and Economic Cooperation (MoFEC)	Approves all development programs including the NFSDP, hosts the CRGE Unit.
Forest Production Value Chain Programmatic Action Area (MEFCC led stakeholder platform)	
Ministry of Environment, Forest and Climate Change (MEFCC)	Hosts the Secretariat for the CRGE. Hosts the Secretariat for the National REDD+ initiative. Develops and follows up on implementation of the NFSDP. Develops and revises forest sector policies, strategies, proclamations, regulations and guidelines. Represents the country in forest related international fora.
Ministry of Industry (MoI)	Promotes and supports wood-based industry development.
Federal Micro and Small Enterprises Development Agency (FeMSEDA)	Leads and supports the development of small and medium scale enterprises.
Ministry of Construction (MoC)	Promotes the use of sustainably produced timber products in the construction sector.
Ministry of Trade	Facilitates the marketing and export of timber and NTFPs.
Customs and Revenue Authority	Supports private sector investors in the forestry sector by implementing incentive packages provided by the government. Monitors imports of timber and NTFPs.
Ethiopian Investment Commission (EIC)	Provides licenses and support to forest sector domestic and foreign direct investors. Develops and revises incentive packages for forestry sector investors.
Agricultural Investment Land Management Agency	Identifies and prepares, in collaboration with regional states, 'ready to invest' land free of tenure conflicts for private investors.
Ethiopian Chamber of Commerce and Sectoral Association (ECCSA)	Coordinates and establishes sectoral associations and regional chapters.



Institution	Institution
Forests and Rural Development Programmatic Action Area (SLMP National Steering Committee led stakeholder platform)	
SLMP National Steering Committee (NSC) Oversees implementation of sustainable land management (Chaired by the State Minister of the Natural Resources Division of the MoANR)	Oversees implementation of sustainable land management activities where forests are one important element. High level representation from MoA, MoFED, MoWIE, MEFCC, and BoAs of the SLMP regions. Establishes policy guidelines and provides overall supervision for project implementation. Approves annual federal and regional work plans and budget. Reviews annual implementation performance reports.
Ministry of Agriculture and Natural Resources (MoANR)	Implements sustainable land management programs. Coordinates watershed based soil and water conservation activities. Implements water harvesting and small-scale irrigation. Intensifies and transforms agricultural development systems and practices.
Ministry of Livestock and Fishery (MoLF)	Promotes quality based livestock production. Develops livestock feedstock production systems. Promotes cut and carry feeding system.
Ethiopian Rural Energy Development and Promotion Center (EREDPC)	Promotes efficient and environmentally sound energy technologies. Facilitates energy development in rural areas.
MEFCC, Community Forestry and Agroforestry Extension Directorate	Supports community-based forest management in the rural landscapes, develops and provides agroforestry extension services.
Forests and Rural Development Programmatic Action Area (SLMP National Steering Committee led stakeholder platform)	
MEFCC, REDD+ Secretariat (Chaired by the State Minister of the Forest Sector Division of the MEFCC)	Coordinates the implementation of the REDD+ initiative of the CRGE. It has multi-stakeholder steering committee that comprises members from relevant ministries, regional level representatives, NGOs, academia and research institutions.
Ethiopian Wildlife Conservation Authority (EWCA)	Undertakes conservation of wildlife and its habitats. Implements sustainable utilization of wildlife resources.
Ministry of Water, Irrigation and Electricity (MoWIE) including EELPCO	Increases access to electricity. Supports watershed conservation activities with particular emphasis on the hydro-dam catchments. Promotes and distributes improved stove technologies. Monitors sustainable use of water resources for irrigation and drinking purposes.
Ethiopian Biodiversity Institute (EBI)	Leads and ensures the appropriate conservation, sustainable use, and access and benefit sharing of biodiversity.
Ministry of Transport (MoT)	Plans and executes construction of road and railways in an environmentally-friendly manner. Creates access to production forest sites.
Ministry of Mines, Petroleum and Natural Gas	Implements biofuel development. Responsible to execute mining in environmentally friendly way.



Ministry of Urban Development and Housing (MoUDH)	<p>Implements urban greening programs.</p> <p>Promotes the use of sustainably produced timber products for housing development.</p>
Ministry of Science and Technology (MoST)	<p>Coordinates the Ethiopian Man and Biosphere (MAB) Program and MAB Committee.</p> <p>Oversees Biosphere Reserves and related initiatives.</p>
Institutional Development Programmatic Action Area (EEFRI led stakeholder platform)	
Ethiopian Environment and Forest Research Institute (EEFRI)	<p>Supports the sector by adapting and generation technologies relevant to sector development.</p> <p>Transfers technologies to end users.</p> <p>Provides training and capacity building to the practitioners in the sector.</p>
Universities	<p>Develop undergraduate and graduate programs that support sector development programs.</p> <p>Conduct sector relevant research and technology transfer.</p>
Ministry of Education (MoE)	<p>Integrates forest and environmental education in to school curriculums.</p> <p>Promotes green schools.</p>
Crosscutting Roles	
National Regional States	<p>Administers land and natural resources including forests in accordance with laws enacted by the federal government.</p> <p>Prepares and implements Regional Forest Sector Development Programs in alignment with the NFSDP.</p>
Development partners (they can participate in the stakeholder platforms of their interest area)	Support implementation of the NFSDP actions.
NGOs (they can participate in the stakeholder platforms of their interest area)	Support implementation of the NFSDP actions.



Annex 4: Existing regional institutions relevant to forestry

National Regional State/City Administration	Existing institutions relevant to forestry
Tigray	Bureau of Agriculture and Natural Resources
Amhara	Bureau of Agriculture and Natural Resources Environment, Forest and Wildlife Protection and Development Authority (EFWPDA) Amhara Forest Enterprise
Oromia	Bureau of Agriculture and Natural Resources Environment, Forest and Climate Change Authority (EFCCA) Oromia Forest and Wildlife Enterprise
Addis Ababa City Administration	Environmental Protection Authority (EPA)
SNNPR	Bureau of Agriculture and Natural Resources Environment and Forest Development and Protection Authority (EFDPA)
Afar	Bureau of Agriculture and Natural Resources (BoANR)
Gambella	Bureau of Environmental Protection, Forestry and Land Administration (BEPFLA)
Benishangul-Gumuz	Bureau of Agriculture and Natural Resources (BoANR)
Ethiopia Somali Region	Bureau of Agriculture and Natural Resources (BoANR)
Harare	Bureau of Agriculture and Natural Resources (BoANR)
Diredawa City Administration	Bureau of Agriculture and Natural Resources (BoANR)

