



Management Plan

(2018-2023)

Gambella Peoples' National Regional State
Majang Zone Administration

May 2018

Project implementation supported by:

MELCA-Ethiopia

Financial Support by:

Sida

Compiled by:
Sintad EcoConsult

Contributing Authors:
Tadesse Woldemariam Gole, Solomon Zewdie, Aseffa Seyoum
Mekbeb Eshetu Tesema, and Mellese Damtie

Photos:
Tadesse Woldemariam Gole and MELCA Ethiopia

May 2018

Contents

Acknowledgement 5
Foreword 6
1 BACKGROUND ..... **Error! Bookmark not defined.**
1.1 Purpose of the Management Plan 10
2 PLANNING AND APPROACH 11
2.1 Participatory Planning 11
2.1.1 Adaptive Management Approach 11
2.1.2 Cooperation 11
3 VISION AND GOALS FOR THE BIOSPHERE RESERVE 12
3.1 Vision for Majang Forest Biosphere Reserve 12
3.2 Strategic and specific Objectives of Majang Forest Biosphere reserve 12
4 DESCRIPTION OF THE AREA 12
4.1 Location and administrative borders 12
4.2 Geographical settings 14
4.3 Flora 14
4.4 Fauna 14
4.5 Current ecosystem degradation 15
5 ZONATION OF THE BIOSPHERE RESERVE 16
5.1 Core Area 16
5.2 Buffer Zone 17
5.3 Transitional Area 17
6 ADMINISTRATION, MANAGEMENT AND COMMUNICATION OF THE BIOSPHERE RESERVE 18
6.1 Infrastructure for management and administration 18
6.2 Public relation and communication 19
6.3 Five-year management plan goals related to BR management 20
7 AGRICULTURE AND LIVESTOCK MANAGEMENT 20
7.1 Desired Outcome and strategies 21
7.2 Five-year management goals related to agriculture and livestock management 22
8 FORESTRY 23
8.1 Desired outcome and Strategies 23
8.2 Five-year management goals related to the forestry sector 26
9 WATERSHED MANAGEMENT 26
9.1 Desired Outcome and Strategies 27
9.2 Five-year management goals related to watershed management 28
10 COMMERCIAL FARMS MANAGEMENT 28

10.1 Desired Outcome and Strategies....29
10.2 Five-year management goals related to commercial farms....29
11 CLIMATE CHANGE ADAPTATION AND MITGATION....29
11.1 Desired Outcome and Strategies....30
11.2 Five-year management goals related to climate change adaptation and mitigation....32
12 URBAN DEVELOPMENT....33
12.1 Desired Outcome and Strategies....33
12.2 Five-year management goals related to urban development....33
13 TOURISM....33
13.1 Desired Outcome and Strategies....34
15.1.1 Desired Outcome....34
13.1.1 Strategy....34
13.2 Five-year management goals related to tourism and public awareness creation....37
14 EDUCATION FOR SUSTAINABLE DEVELOPMENT....38
14.1 Desired Outcome and Strategies....38
14.2 Five-year management goals related education for sustainable development....40
15 RESEARCH, MONITORING, AND EVALUATION....40
15.1 Basic research principles in biosphere reserves....40
15.2 Research in south-western forest area....41
15.3 Research in the Biosphere Reserve....41
15.4 The monitoring programme for Majang Forest Biosphere Reserve....43
15.5 Monitoring in core areas and buffer zones....44
15.6 Coordination of the monitoring programme....45
15.7 Five-year management goals related to research, monitoring and evaluation....45
16 LEGAL AND INSTITUTIONAL ARRANGEMENT....45
16.1 Applicable laws for the biosphere reserve management....45
16.2 Management Structure for Majang Forest Biosphere Reserve....45
16.3 National and regional oversight institutions....46
16.4 Regional state level management institutions and their role....46
16.5 Zonal level management institutions and their roles....47
16.6 Woreda level management institutions and their role....47
16.7 Community level institutional arrangement....47
16.8 Coordination....47
17 RESOURCE MOBILIZATION AND COST ESTIMATES....47
17.1 Sources of finance....47
18 REFERENCES....48

ACKNOWLEDGEMENT

The Majang Zone Administration is grateful for the continuous support of MELCA Ethiopia. MELCA has swiftly responded to our request in 2012 and started working in Majang in 2013. MELCA Ethiopia has conducted baseline studies, supported the nomination process, facilitated preparation of the management, and started pilot implementation of the management plan and environmental governance activities. Our heartfelt thank also goes to MELCA Ethiopia who have worked hard to realize this, especially the current and former Executive Directors Mr. Solomon Kebede and Dr. Million Belay, and the Program and Project Coordinators: Mr. Bereket Weldegiorgis, Mr. Befekadu Refera, Mr. Dereje Jenbere, Mr. Sirage Hussein and Mr. Hailu Merga. All MELCA Ethiopia Branch office in Majang staff members, especially Mr. Demissie Jemaneh and his staff provided invaluable supports. Designation of the Majang Forest as UNESCO biosphere reserve and preparation of this management plan would not be realized without the technical support of Dr. Tadesse Woldemariam Gole.

Last, but not least, we would like to thank the donors that have financially supported initiative. The Swedish Society for Nature Conservation has supported the initial baseline study. The Swedish International Development Agency (Sida) financed the nomination process, preparation of this management plan, implementation development activities on environmental governance and livelihoods, as well as pilot implementation of the biosphere reserve approach in Majang. We would like to extend our heartfelt thanks to Sida staff in Addis Ababa for their unreserved support, especially Dr. Annelika…., Mr. Elmi Nure and Mrs. Annika Jayawardena. We hope Sida's support will continue for the successful implementation of the management.

FOREWORD

The Majang zone of Gambella Peoples' National Regional State is endowed with natural resources. Most of its landscape is covered with natural forests with diverse species of plants. It is also endowed with water resources, having several perennial rivers and over 2000 mm annual rainfall. Majang is also rich in biodiversity at all levels of biological diversity: ecosystem, species and genetics. It has at least 4 different ecosystems or habitat types. Over 550 higher plants, 33 mammals, 130 birds, and 20 amphibian species were recorded in the area. It is also the centre of origin and diversity for many crop genetic resources.

Its richness in natural resources makes the area attractive for agricultural development. Hence, there is a growing demand for agricultural land expansion by small-holder farmers as well as large scale agricultural investment. Deforestation for agriculture, coupled with current trend of climate change, are considered as threats to biodiversity and the traditional livelihoods of the local community.

The Majang zone administration and the Gambella regional state joined hands with MELCA Ethiopian in 2012 to explore and adopt sustainable development options. After conducting baseline studies and evaluation of different development approaches, it was decided to adopt the UNESCO Biosphere Reserve approach. This approach has been tested over the past 45 years in different parts of the world, and evolved to the best approach for sustainable development that integrates conservation, development, research, education and continuous monitoring. MELCA Ethiopia is one of the pioneers in implementing the UNESCO biosphere reserve approach, starting the Sheka Forest Biosphere Reserve in the neighbouring zone. Adopting this approach also means putting large and connected forested landscapes in southwest Ethiopia under similar management approach since the Kafa and Sheka Forest in SNNP and Yayu Coffee Forest in Oromia are also UNESCO biosphere reserves.

Adopting UNESCO biosphere reserve approach means following an adapting resource management practice that evolves informed by lessons local level practices, research and monitoring findings and best practices from around 700 biosphere reserves around the world, which the Majang Forest Biosphere Reserve joined in June 2017. To realize sustainable development, MELCA Ethiopia has worked with the Majang zone administration and local stakeholders to prepare this comprehensive management plan. The management plan was prepared through active participation of the local communities, experts from different sectors and decision makers at different levels.

We hope that this management plan will fulfil the ambition managing the forested landscape of Majang zone, and ensure provision of the three functions of a UNESCO biosphere reserve: conservation, development and logistic support (research, education, monitoring.

Solmon Kebede, Executive Director

MELCA Ethiopia

EXECUTIVE SUMMARY

Initiative to adopt the UNESCO biosphere reserve approach in Maiang started back in 2013 with a feasibility study and launch of the nomination process. Following submission of the nomination document to UNESCO in September 2016 by the Government of Ethiopia, UNESCO approved listed the Majang Forest Biosphere Reserve on the World Network of Biosphere (WNBR) in June 2017. This management plan is prepared to serve as a roadmap that guides implementation of various activities in the biosphere reserve in order to achieve both development and conservation goals, while advancing knowledge generation and dissemination through research, monitoring and education. The management plan outlines conservation, development and research activities under different locally relevant intervention themes.

The Vision of Majang Forest Biosphere Reserve is to be a place where nature and people live in greater harmony, for sustainable, equitable and prosperous livelihood. The overall objective is implementation of integrated landscape management practices through appropriate spatial planning that harmonizes conservation and sustainable development based on tested scientific and indigenous knowledge and innovations, by adopting the UNESCO biosphere reserve approach.

The specific objectives of the biosphere reserve are:

- To spatially allocate the area for different land uses that integrate conservation, development, research, education and innovations for sustainability;
- Ensure conservation of key habitats for biodiversity (genes, species, ecosystem, culture) in the area through participatory monitoring and adaptive responses to observed threats and changes;
- Promote sustainable economic development through improved production and processing practices, value addition and market-linkage that rewards local agricultural and forest products producers for their good practices;
- Promote participation, and equitable benefit sharing to all community members in the biosphere reserve;
- Engage development partners and mobilize resources to support local initiatives; and
- Build strong local, national and international partnership and network for research, monitoring, and lifelong learning.

To achieve these objectives, the biosphere reserve is divided into three management areas: Core Areas, Buffer Zone and Transition Area. The basis for zonation of the Majang Forest Biosphere Reserve include: the inclusion (representation) in the core and buffer zones the major habitat types, high biodiversity spots and topographically critical areas of important watersheds; exclusion of settlement, agricultural areas, and river courses from core areas; and classification of large tract of forest areas in the buffer and transition zones owing to the heavy dependence on forests of local community livelihood and cultural practices.

The core area constitutes that part of the reserve area exclusively established for the conservation of biodiversity, and it constitutes 19.5% of the total Forest Biosphere Reserve. The **buffer zone** constitutes an area of the biosphere reserve encircling the core areas generally meant to provide the function of minimizing the negative impacts of human activities on the core zones, and cover around 36.5% of the total area. Human activities in the buffer zone are compatible with the conservation objectives of the core area while playing an important role in maintaining anthropogenic, biological and cultural diversity.

The **transition area** constitutes the largest area of the three and encompasses the area outside of the core and buffer zones where high impact and economic land uses and other human

activities are taking place. It covers around 48% of the total area of the biosphere reserve. The transitional area provides the space where communities and other actors live and manage the natural resources sustainably, and is often described as development zone.

The management activities are organized by thematic areas that are going to be implemented by respective sectors at different levels. The themes include: administration, management and communication of the biosphere reserve; agriculture and livestock management; forestry, watershed management; commercial farm management; climate change adaptation and mitigation; urban development; tourism; education; and research, monitoring and evaluation.

The management arrangement for the Majang Forest Biosphere Reserve is embedded in the existing government institutional arrangement, with additional support unit to coordinated and facilitate inter-sectoral cooperation. The Administration Office at all levels has the role of coordinating and overseeing activities by different sectors. The office also consolidates plans of different sectors, and monitor performances.The management plan is implemented at zone, Woreda and community level within Majang zone. The Majang Forest Biosphere Reserve Coordination Office (BRCO) is hosted by the Majang Zone Administration Office. The BRCO coordinates activities by implementing sector organizations at zonal level, and also at Woreda level through Woreda Focal Person. The management structure also included cabinet level Task Forest and a Technical Advisory Board.

The sources to finance implementation of the management plan are generated from government budget, program budget like the regional REDD+ Readiness Program and Sustainable Land Management Programs, development partners.

The Management Plan is for initial period of 5 years, 2018-2023. However, it dynamic and can be modified, updated any time throughout the implementation, informed by research findings, lessons from best practices and emerging challenges in the area.

1 INTRODUCTION

The Majang Forest Biosphere Reserve is the newest addition to sites from Ethiopia listed on UNESCO's World Network of Biosphere Reserve. Following the nomination by the Government of Ethiopia in 2016, UNESCO listed it in June 2017. The biosphere reserve is located in the Majang Zone of the Gambella Peoples National Regional State. It covers a unique biogeographic unit, including Moist Afromontane forest, Transitional Rainforest and Combretum-Terminalia woodland biome types, dotted with small wetlands, a lake and several rivers that drain the landscape.

Moist evergreen Afromontane forest vegetation grows at altitudes from 1500to 2500m, and has long been considered as one of the most threatened eco-region in the world (White 1983). Ethiopia has the biggest land surface falling within the Afromontane region. This biome is the most diverse biome in forest tree species and associated plant and animal species.

Transitional Rainforest vegetation is a unique biome type to southwest Ethiopia, and most of the Majang Forest Biosphere Reserve falls under this. It occurs on the escarpments and gentle slope within the altitudinal range of 500–1500 m. It is also known as Low Land Semi-Evergreen Forests. The transitional rainforests are similar to the Afromontane rainforests in structure and species composition, with additional species from lowland forest vegetation. The transitional rainforest also has some trees and shrubs not known from either of these two forest types like *Pouteria altissima*, *Celtis zenkeri* and *Elaeodendron buchananii*. The Combretum-Terminalia woodland only occurs marginally.

The biosphere reserve is important for different reasons:

1. **Conservation of biodiversity**: The area is rich in plant and animal species. The area is rich in plant and animal species. Over 550 higher plants, 33 mammals, 130 birds, and 20 amphibian species were recorded in all habitat types within the proposed biosphere reserve. There also many endemic species; at least 27 plants, 5 birds and 3 amphibians. Altogether, there are over 35 endemic species of plants and animals, though the level of endemicity has not been determined in many animal taxa. There are also over 39 threatened species (IUCN Red list) in the area, which include 5 birds, 3 mammals, 3 amphibians and 28 plant species. The number of threatened species is likely to be higher when the status of other species is determined.
2. **Deep-rooted culture of nature conservation**: The local communities in the area have deep-rooted culture associated with the use and conservation of forest and natural resources. The Majang people, for example, are highly forest dependent community for food, and extraction of different products. Hence, they conserve and maintain forest as part of their livelihood. Similarly, the people of Shakaliving in kebeles bordering Sheka zone have deep-rooted culture of conserving species, ecosystems and pristine natural habitats traditionally designated as sacred sites and landmarks like waterfalls, mineral water springs, and forests on slopes, wetlands and historical caves. Ecologically fragile areas like wetlands, lakes, rivers and steep slope, forests and other natural landscapes have special cultural values among the people. Large intact forest landscapes throughout the zone are either Jang (Majang people) or Kobo (Sheka people) forests (Wakjira and

Gole, 2007; Gole and Ilfata 2013). Jang and Kobo are traditional private tenure rights that are inherited along kinship lines. Owners used to manage forests for different NTFPs production like food, medicine, honey, household utensils (basket, tengi, clay soil for pottery, etc). In forests areas traditionally owned by a family, livelihood activities like hunting, beekeeping, harvesting wild-edible plants, and raw materials for production of different utensils were prohibited without the permission of the owner, and therefore, protected. Other important forest related traditional practices of the Majang include "Koloye". It is a traditional religious practices area, with big trees like *Ficus vasta*, and *Morus mesozygia*.

3. **Watershed of regional and global importance:** These forests play an important role in protection of watersheds that have local and international significance in the Nile basin, conservation of biodiversity, flood and erosion control, and carbon-sequestration to mitigate the effects of climate change. It is drained by rivers likeAlwero, Gilo and Akobo, which are the main tributaries of the White Nile.

4. **Conservation of crop plant genetic resources:** The Majang zone is an important gene pool for Ensete (*Ensete ventricosum*, sometimes called 'false banana'), *Dioscorea praehensilis*, and other plant species important as food, agricultural and forestry purposes. The agricultural landscape surrounding the forest area is mainly under perennial crops like Ensete, coffee and fruit trees. It is important for the conservation of cultivated landraces of ensete (*Ensete ventricosum*), coffee (*Coffea arabica*), anchote (*Coccinia abyssinica*), Oromo-Dinch (*Plectranthus edulis*), Chili pepper (*Capsicum frutescens*), *Dioscorea praehensilis*, Cabbage (*Brassica oleracea, B. nigra*) and other crops.

5. **Farmlands and homegardens:** The agricultural land consists of mainly smallholder farms with diverse crops and homegardens, and large scale coffee plantations. Most crops are traditional landraces. The croplands, homegardens, the managed forests and the natural forests, altogether form a characteristic cultural landscape in the region, depicting domestication stages and evidences of agricultural evolution.

1.1 Purpose of the Management Plan

The management plan will serve as a roadmap that guides implementation of various activities in the biosphere reserve in order to achieve both development and conservation goals, while advancing knowledge generation and dissemination through research, monitoring and education. The management plan outlines conservation, development and research activities under different locally relevant intervention themes. UNESCO also requires that a biosphere reserve has a management plan to guide management of the different zones and develop the region in a sustainable way. Hence, this management plan of the Majang Forest Biosphere Reserve is in accordance with the Statutory Framework of the World Network of Biosphere Reserves and the goals of UNESCO's Seville Strategy for Biosphere Reserves. The management plan has also considered the guidelines provided in the management manual for UESECO Biosphere Reserves in Africa developed by AfriMAB partners.

The management plan also considers regional development policies and land-use planning, and plans, and lower level administration structures (zone, woreda, kebele) in the area. The

management plan shall provide clear orientation for the biosphere reserve management or coordination unit (BRMU) and all sector institutions and stakeholders involved in the management and sustainable development of the area, with clear roles and responsibilities. It covers a period of five years, beginning from 2018.

2 APPROACH FOR MANAGEMENT PLAN PREPARATION AND REVISION

2.1 Participatory Planning

The management plan was prepared through participatory approach to get the support and involvement of local communities and stakeholders. In the course of the preparation of the nomination document of the Majang Forest Biosphere Reserve, active participation of local communities has been sought especially in the formulation of visions and goals for the biosphere reserve, in the zonation process as well as in the preparation of this management plan. For management plan preparation, various government bodies, non-governmental organisations, private enterprises and individual stakeholders on the regional and local level have been consulted through workshops, expert interviews, focus group discussion, field trips and validation of the management plan document.

2.1.1 Adaptive Management Approach

An adaptive planning approach should be applied in the management of the biosphere reserve. Adaptive management is a process that supports flexible decision-making which can be adjusted as outcomes from previous management activities become better understood. Careful monitoring and impact assessment of management outcomes both advances scientific understanding and helps adjust policies or further activities as part of an iterative learning process. In this sense, the management plan can be regarded as a dynamic document that can continually be updated and amended in accordance with the results of research, monitoring, and evaluation activities.

2.1.2 Cooperation

Stakeholders shall be strongly encouraged to closely coordinate their activities for successful land use planning. At the national and regional levels, this involves collaboration on:

- Selecting priority areas for BR management interventions (e.g. highly degraded and/ or densely populated areas and areas of special biodiversity conservation value);
- Harmonizing the different sectors' land use plans (e.g. forestry and agriculture, or fisheries and infrastructure development);
- Coordinating fundraising activities (from local or international non-governmental organisations (NGO's), state organisations and other institutions working in the area);
- Transferring information and relevant experiences (especially results of studies and surveys in the area, e.g. by setting up a database).

At the local level, resource users in the communities, government officials, researchers, and educators all need to contribute to decision making on future management measures. In this

regard, the management plan supports the development of a community-based management approach.

3 VISION AND GOALS FOR THE BIOSPHERE RESERVE

3.1 Vision for Majang Forest Biosphere Reserve

The Vision of Majang Forest Biosphere Reserve is:

Majang Forest Biosphere Reserve- ***a place where nature and people live in greater harmony, for sustainable, equitable and prosperous livelihood.***

3.2 Strategic and specific Objectives of Majang Forest Biosphere reserve

The overall objective of the Majang Forest Biosphere Reserve is implementation of integrated landscape management practices through appropriate spatial planning that harmonizes conservation and sustainable development based on tested scientific and indigenous knowledge and innovations, by adopting the UNESCO biosphere reserve approach.

The specific objectives of the biosphere reserve are:

- To spatially allocate the area for different land uses that integrate conservation, development, research, education and innovations for sustainability;
- Ensure conservation of key habitats for biodiversity (genes, species, ecosystem, culture) in the area through participatory monitoring and adaptive responses to observed threats and changes;
- Promote sustainable economic development through improved production and processing practices, value addition and market-linkage that rewards local agricultural and forest products producers for their good practices;
- Promote participation, and equitable benefit sharing to all community members in the biosphere reserve;
- Engage development partners and mobilize resources to support local initiatives;
- Build strong local, national and international partnership and network for research, monitoring, and lifelong learning.

4 DESCRIPTION OF THE AREA

4.1 Location and administrative borders

The Majang Forest Biosphere Reserve is located in the Majang Zone of Gambella National Regional State. The Majang zone is one of the three administrative zones of the Gambella Regional state. The zone has two weredas (Mengeshi and Godere) and 26 kebeles.

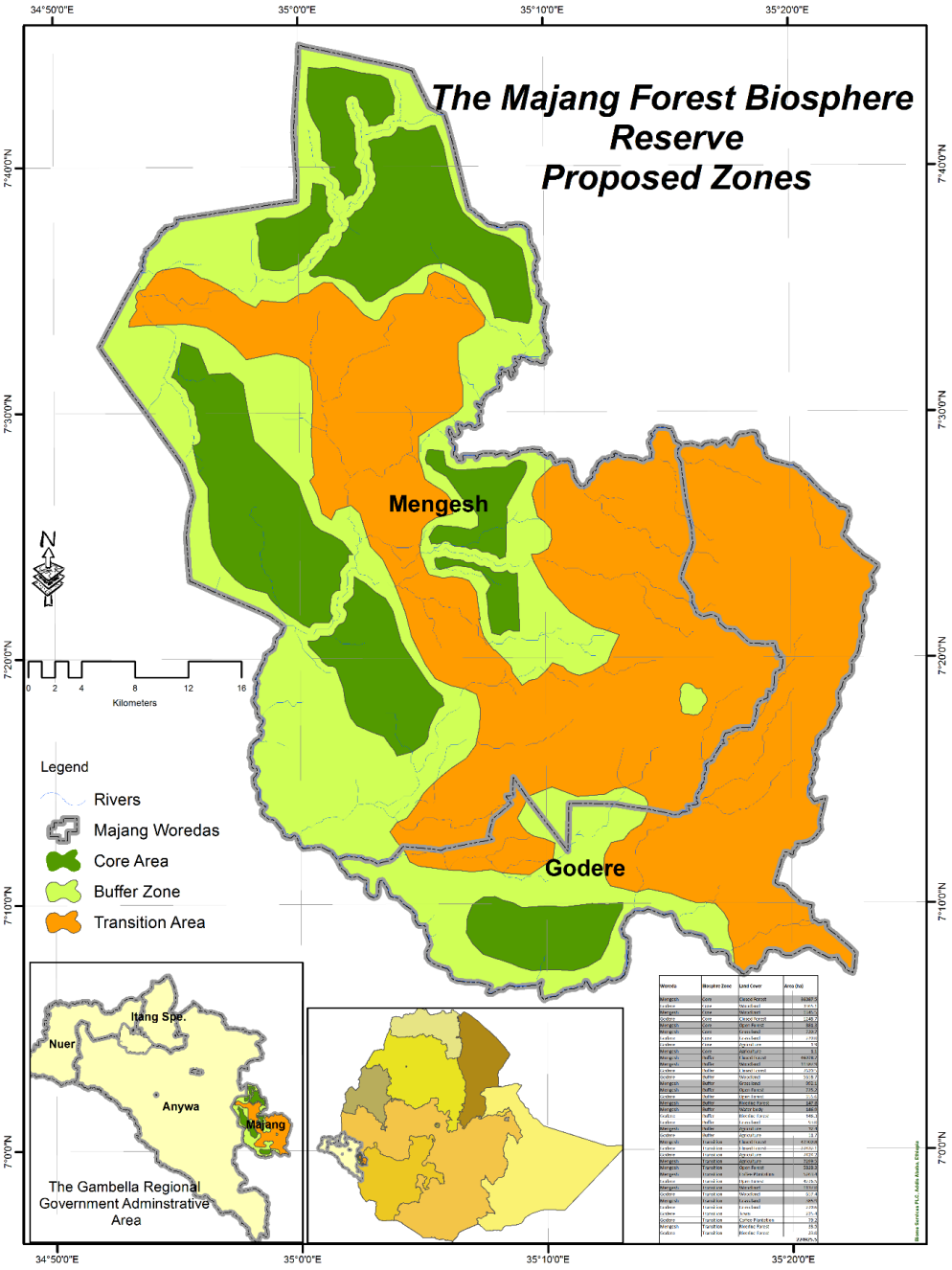


Figure 1. Map of the Majang Forest Biosphere Reserve

The Majang zone is bordering Sheka and Bench Maji zones (of SNNPR) in the east, Anywa zone of Gambella regional state in the west and Illu Ababor zone of the Oromia regional state in the north (Figure 1). Majang Forest Biosphere Reserve is located between 7°06'07"N and 7°45' 10" N latitude, and 7°23' 39" E and 7°32' 49" E longitude and covers a total area of 224,925 ha of forest, woodlands and other land uses. The biosphere reserve falls within an altitudinal range of 560 to 2600m above sea level.

4.2 Geographical settings

Climate

The climate of the area is characterized as hot and humid and represents one of the wettest areas in Ethiopia. The average temperature of the warmest month is 33°C, while the average temperature of the coldest month is 20°C. The mean annual precipitation is 2100 mm.

Soils

The soils of the area are derived from parent materials of Cenozoic and Proterozoic volcanic sediments common in the south-western part of Ethiopia (Schlüter, 2008). The soils area are recognized as a red brown to dark brown ferrisols, of mostly dystricnitosol. Most of these soils are moderately acidic with a high cation exchange capacity (Murphy 1968). The prevalence of high rainfall has masked other soil forming-factors and hence, very similar soils have developed on a variety of parent materials. Other soil groups in the area include nitosols, acrisols, vertisols, and cambisols (Tafesse Asres1996).

Hydrology

The area is generally highly dissected by several rivers and small streams that fall within the Nile basin. The major rivers include the Alwero, Gilo and Akobo rivers. The landscape in the area is also dotted by numerous small wetlands and marshes. Wetlands on the highlands are dominated by ferns and grasses, while the lowland wetlands are dominated by palm trees. The lowland woodlands are often characterized by clusters of lowland bamboo thickets.

4.3 Flora

The flora of Gambella region is characterized by a diversity of forest types. The dominant habitat types in the biosphere area are the Moist evergreen Afromontane Forest, the Transitional Rain Forest, Combretum-Terminalia Woodland, and riverine forest vegetation. Among these forest types, the Transitional Rainforest is unique to the escarpments of southwestern Ethiopia and a large tract of this forest type is found in the biosphere reserve. The forest vegetation is part of a biodiversity hotspot globally considered as threatened ecosystems that deserve conservation attention (National Biodiversity Strategy). A total of around 530 plant species were recorded in the biosphere reserve, of which 27 are endemic to Ethiopia.

4.4 Fauna

Apart from its rich floristic diversity, the Majang Forest Biosphere Reserve is home for a diversity of mammal, bird, amphibian and reptile species, a number of which are endemic. Among the many mammals, some of the characteristic species include Leopard, different species of monkey, Bush pig, Bushbuck, African Buffalo, porcupine, jackal, and spotted hyena.

The biosphere reserve is also known for its rich avian diversity (over 130 species), a number of these birds being endemic. Many amphibian and reptilian species were also reported in the forest of the biosphere reserve. The biosphere reserve is home for endemic species of the rodent *(Praomys albipes)*, three endemic species of frogs, and a species of snake.

4.5 Current ecosystem degradation

The diversity of ecosystems within the biosphere reserve is known to provide multiple ecosystem functions. These ecosystem functions can be grouped as *provisioning* (food, medicine and watershed protection, fresh water); *regulating* (erosion prevention, carbon storage and local climate regulation); *supporting* (habitats, genetic diversity) and *socio-cultural* (aesthetic, spiritual) services. Despite these ecosystem services the biosphere can potentially provide, the area is being impacted by increasing pressure from human activities.

The Majang people has been practicing shifting cultivation where they allow a cultivated area for a couple of years and move to other forest areas and thus allowing the fallow to regenerate. This livelihood activity of the local population has been fairly in harmony with the ecosystem process and contributed for the large forest cover that has been maintained in the area for so long. None the less, with increasing migration of human population from the central high lands in search of farm lands, agricultural expansion through clearing of forests becomes rampant. On top of that, a growing pressure from large scale agricultural investment in the area has resulted in deforestation. According to Gole and Ilfata (2013), there was a decline in dense forest covers from 75% to 38% in the course of about 25 years (1987 – 2013). The same authors reported that the human activity (agriculture and settlement) reduced undisturbed dense forest by 26.4% between 1987 and 2001 while the conversion of natural forest to open forests managed for coffee production increased tremendously (133%) in just 11 years (2001 – 2012).

In a recent land use land cover study of the Majang Zone, Bewuketu et al. (2017) reported that a total of 35,977 ha of forest was converted to plantation (Coffee) between 1987 to 2016 i.e. on average 1240 ha/year. For the same period, additional forest was converted into woodland (12,908.8ha) and agricultural land (11,299.6ha).

The major causes of deforestation and degradation include expansion of coffee plantation; increasing settlements and subsequent agricultural expansion, logging and burning of forests to clear the area for shifting cultivation.

With increasing interest of agricultural investment like tea plantation and increasing human population, the threat on the natural forest is expected to continue unabated. Underlying these direct drivers of ecosystem degradation, population increase, poverty, gaps in policy, weak law enforcement and limited institutional capacity have all contributed to habitat loss and ecosystem degradation. Other drivers of ecosystem loss include illegal investment in coffee plantation, development of infrastructure like roads, lack of alternative source of energy, lack of alternative employment opportunities.

Addressing these direct and underlying drivers of deforestation requires tackling demographic pressures and introducing livelihood improvement schemes to reduce the pressure on the forest. These interventions should in fact be reinforced with an enabling policy environment by putting in place legal and institutional frameworks to protect the forest.

5 ZONATION OF THE BIOSPHERE RESERVE

The Majang Forest Biosphere Reserve, as one of the UNESCO's World Network of Biosphere reserves, is established with the aim of realizing integrated natural resource management of the area by combining conservation with resource planning and use. To achieve this goal, the biosphere reserve is divided into three management areas or zones each of which serve specific function.

The basis for zonation of the Majang Forest Biosphere Reserve include: the inclusion (representation) in the core and buffer zones the major habitat types, high biodiversity spots and topographically critical areas of important watersheds; exclusion of settlement, agricultural areas, and river courses from core areas; and classification of large tract of forest areas in the buffer and transition zones owing to the heavy dependence on forests of local community livelihood and cultural practices.

5.1 Core Area

The core area constitutes that part of the reserve area exclusively established for the conservation of biodiversity. The **core areas** aim at protecting the landscape, ecosystems, species and genetic resources it contains. The Majang Forest core areas constitute about 19.5% of the total Forest Biosphere Reserve (Table 1). The protected area is close to the 20% national target planned to be achieved by 2020 (NBSAP 2015). These areas are strictly protected from human activities and a number of activities (including settlement, agriculture, livestock grazing, timber harvesting etc are not recommended in the core areas. However, activities like extraction of non-timber forest products, establishing research plots and demonstration sites and enrichment planting using indigenous species can be undertaken.

The core area largely represents intact undisturbed natural forests (Afro-montane and transitional rainforest), and some areas Combretum-Terminalia woodland and bamboo tickets, distributed along altitudinal gradients from well over 2400 m to 560m a.s.l. The core area is 43,882 ha, and hence covers areas large enough to conserve biodiversity, representative natural habitats, including the Afromontane rainforest, the transitional rainforest and woodland, and provide ecosystem services.

Table 1.The area (ha) of different land uses in the three zones

Management Zones	Dense Forest (ha)	Open forest (ha)	Woodland & Bamboo tickets ha)	Grass-land (ha)	Water bodies /rivers & lakes (ha)	Coffee plantation (ha)	Agriculture & settlement (ha)	Total (ha)
Core Zone(s)	37,336.2	881.3	4,710.5	950.6	0.0	0.0	0.0	43878.8
Buffer Zone(s)	53,699.2	10,80.8	17,046.7	1,085.1	441.0	0.0	47.1	73399.9
Transition Zone(s):	74.733.0	10,104.9	1,794.3	656.5	66.5	5,907.5	14,949.0	108211.8
TOTAL:	**165,768.4**	**12,067.0**	**23,551.5**	**2,692.3**	**507.6**	**5,907.5**	**14,996.2**	**225490.5**

5.2 Buffer Zone

The buffer zone constitutes an area of the biosphere reserve encircling the core zones generally meant to provide the function of minimizing the negative impacts of human activities on the core zones. Human activities in the buffer zone are compatible with the conservation objectives of the core zones while playing an important role in maintaining anthropogenic, biological and cultural diversity.

The **buffer zone** accommodates more human activities such as research, environmental education and training as well as tourism and recreation while protecting natural or cultural landscape. According to the management guideline, some of the management activities recommended in the buffer zone include (but not limited to) agricultural activities, coffee management, extraction of non-timber forest products, tourism and education, and reforestation. On the other hand, settlement, timber harvesting, and hunting of wild animals are some of the activities that are not recommended in the buffer zone.

The buffer zones of the Majang Forest Biosphere Reserve cover an area of 73,397 ha (Table 2) of cultural forests, managed forests for spices, coffee and honey production, secondary forest following fallows, shifting cultivation areas and woodland. The buffer zone also encompasses the Godere (Majang) National Forest Priority Area, protected by both federal and regional government forest proclamations. It includes undisturbed natural forests, managed forests for coffee and other NTFPs, disturbed and secondary forests and lowland wooded grassland.

The forests in the buffer zone have multiple functions: cultural, economic and ecological functions. Some forests are culturally protected by the community and used for religious ceremonies and cultural festivals. Economically, the forests are used for honey, spices and coffee production, as well as extraction of other NTFP and local construction materials. Cutting trees for timber is strictly forbidden by the federal and regional government forest proclamations, which also apply in the core area.

5.3 Transitional Area

This part of the reserve constitutes the largest area of the three and encompasses the area outside of the core and buffer zones where high impact and economic land uses and other human activities are taking place. The transitional areas provide the space where communities and other actors live and manage the natural resources sustainably.

The **transition area** is characterized by different human activities including agricultural activities, human settlements and other land uses. The transition zone has great economic and social significance for regional development. The transition zone occupies 107,645 ha and contains some degraded forests, cropland, grazing-land, grassland, riverine vegetation within agricultural landscapes as well as urban and rural settlement areas. This zone is where most the human population in the biosphere reserve resides, and is therefore under intensive human use. This will provide an appropriate context for land-use related problem identification and participatory solution formulation.

6 ADMINISTRATION, MANAGEMENT AND COMMUNICATION OF THE BIOSPHERE RESERVE

6.1 Infrastructure for management and administration

Following discussions with key stakeholders and synthesis of possible scenario, institutional arrangement that enables effective management, coordination and integration of biosphere reserve programmes and activities have been put in place. The institutional arrangement is also in line with the Seville Strategy (UNESCO 1996).

In order to coordinate and lead the Majang Forest Biosphere Reserve nomination and initial developments, two institutional arrangements were put in place- MELCA Ethiopia's Majang Project Office and the Majang Zonal Biosphere Reserve Task Force. MELCA Ethiopia's Project Office facilitated baseline studies, consultations of stakeholders, preparation of the biosphere reserve nomination document and implementation of various environmental governance and livelihood activities, together with the Task Force.

Following successful completion of the nomination process, the initial institutions made efforts to mainstream biosphere reserve implementation into the programs of key sectoral institutions. For the management and administration of the biosphere reserve from 2018 onward, institutional arrangement that has considered the local situation has been established. The overall goal of such arrangement is ensuring transparent and full participation of all relevant sectors, academia, development partners, experts and local communities. The list of newly created management and administration institutions to strengthen implementation is presented below (Table 2)

Table 2. New Biosphere Reserve institutions to strengthen implementation and their roles

No.	Institution	Role
1	Biosphere Reserve Coordination Office	- Responsible for day to day coordination of the overall biosphere reserve activities; - coordination with key implementing sectors, private sectors and development partners - Coordinates research, monitoring and education - Coordinates communication and information dissemination, including networking with national and international partners.
2	Biosphere Reserve Task Force (composed of zone cabinet members)	- Assesses annual plans, quarter and annual reports - Advises the zone administration and the coordination office on administrative and implementation arrangement issues - Oversees different development interventions within the biosphere reserves and assesses their compliance with the biosphere reserve long and short term goals. - Advises the zonal investment board

No.	Institution	Role
3	Biosphere Reserve Advisory Board	- Provide technical advises to the zone administration, as well as the coordination office and task force as required - Support in identifying key issues related to research & innovative development interventions
4	Woreda Level Biosphere Reserve Focal Person	- Coordinate Woreda level interventions with key stakeholders and partners - Consolidate reports and submit to the coordination office
5	Kebele Level BR Task Force	- Mobilize the community for different biosphere reserve activities, including monitoring - Report to the Woreda administration and BR focal person

6.2 Public relation and communication

One of the key functions of the Biosphere Reserve Coordination Office is public relation (PR) and communication on local, regional, national and international level. The Coordination Office will facilitate public relation and communications through:

- Development of a leaflet both in Amharic and English on the background and aims for the establishment of Majang Forest biosphere reserve;
- Development of brochures on the biosphere reserve;
- Development of a webpage for the project and for Majang Forest Biosphere Reserve;
- Organizing regular workshops and round table meetings, ensuring involvement, active participation, and support of stakeholders from local to regional levels;
- Presentations at regional, national and international conferences, workshops, and other meetings;
- Inviting national and international partners to the area for support of the biosphere reserve project;
- Using the national/ regional and international media to promote the progress of the project;
- Develop awareness creation films in different languages;
- Development of a Biosphere Reserve Logo.

Establishment of National Network of Biosphere Reserves has initiated. To facilitate this process, MELCA Ethiopia has hosted meetings of the Network initiative in Gambella in 2017 and in Jimma in 2018. MELCA Ethiopia has also initiated a research network, involving local universities like Gambella, Mettu and Mizan-Teppi. Up to now, three thematic research works were conducted by the three universities, on: Ecotourism options in Majang Forest Biosphere Reserve and multidisciplinary studies on Environmental and Socio-Economic issues in Majang Zone of Gambella Region.

The Coordination Office will also develop and disseminate signs and stickers with the biosphere reserve logo and vision, and plant bill boards with information about the BR at different locations in and around the biosphere reserve, including Meti town, Mengeshi and other major settlement areas and boundaries between management zones.

6.3 Five-year management plan goals related to BR management

The quality a nd efficiency of all aspects of the biosphere reserve management plan implementation depends on the BR management. Good BR management leads to speedy, efficient and well-coordinated implementation of the management measures. In order to put good BR management in place, the first five years goals are:

1. BR monitoring and evaluation system is operating and at least yearly BR monitoring reports are published.
2. The Biosphere Reserve Coordination Office will have at least 5 full time technical staff at zonal coordination office and two focal person at weoreda level, and a secured long-term financing mechanism.
3. The Coordination office has applied for at least five donor funded projects, one each year.
4. The Coordination Office has facilitated 4 Taskforce and 2 Advisory Board meetings every year.

7 AGRICULTURE AND LIVESTOCK MANAGEMENT

MANAGEMENT CONTEXT

In Majang Forest BR area, crop land and settlement covered 10.7%, while coffee and other types of agro-forests constituted around 17.9%, making the total land under agriculture around 28.6% (Gole and Ilfata 2013). The farming system is characterized by annual crops, coffee agro-forests and livestock mixed farming. Farm households produce food crops for own consumption and market, and mainly produce coffee and cash crops like coffee, spices and fruits (Mango and Avocado) for cash income.

There are both smallholder farms and large commercial farms in the area. Large scale commercial farms are mainly coffee estates. Farming methods are mostly traditional- ox plough in major fields and hoe in home gardens. Shifting cultivation is practiced by the native Majang population, this practice is decreasing. However, most farmers practice crop rotation to restore the fertility status of the soil as well as to minimize the build up of weeds, insect pests and plant diseases. The fields under agro-forestry practices are mainly permanent and used for tree crops production.

The common perennial crops in the agro-forest system are coffee (*Coffea arabica*), mangos (*Mangifera indica*), and avocado (*Persia americana*). The native Majang people have also started to settle permanently in villages as settled farmers as opposed to their traditional shifting cultivation style (Ojulu, 2013). The agricultural sector is characterized by low productivity and limited use of agricultural inputs such as fertilizer, pesticide and improved seeds.

Some of the challenges in the agriculture sector include:

Crop production sub-sector: challenges in crop production sub-sector include shortage of arable land due to population growth (natural and immigration to the area); lack the supply of agricultural inputs (such as improved seeds, agro-chemicals), and when supplied are not timely; low coffee productivity due to disease, limited access to improved coffee variety and extension service; decrease in pasture areas due to the expansion of commercial farms; and poor agricultural extension service.

Livestock development sub-sector: challenges in livestock development sub-sector include limited pasture area and forage; lack of improved livestock breeds; and lack of veterinary service in the area.

Apiculture sub-sector: Beekeeping in the area is highly tradition with limited adoption of modern beehives and lack of expertise in modern beekeeping. The bee colonies are declining from time to time with the use of insecticides among commercial coffee growers and large scale farms.

7.1 Desired Outcome and strategies

The desired outcome is to minimize spatial expansion of agriculture, and rather increase quality and quantity of agriculture products, adopting environment friendly sustainable agricultural practices. Hence, it is aimed to improve farming methods through Conservation Agriculture principles. In particular, this includes:

- Increased soil fertility through application of organic fertilizers and suitable crop rotation;
- Physical and biological prevention measures against erosion;
- Multi-storey agro-forestry systems;
- Reduced application of agro-chemicals and replacement with biological means for pest control as well as organic fertilizers;
- Improve quality of cash crops to meet standards that local and international market demands;
- Increased and improved crop production and livestock rearing in the transition zone
- Modern beekeeping, poultry and animal fattening among local households in the transition zone of the biosphere reserve
- Well developed and well integrated market chain of high value agricultural products such as coffee, honey, fruits and spices

Strategies

- Promote crop production staple crops such as maize, sorghum, rice and enset in the transition zone, among other things, by supporting provision quality seeds. These crops are the major crops that play role in fulfilling the consumption needs. It is also

important to promote root crops that has food security importance such as yams, godere, and anchote

- Promote production of vegetables such as tomato, cabbage, onion, shallot, potato, and sweet potato in the transition zone
- Promote production forest and semi-forest coffee production in transition and buffers zone
- Promote production of fruits such as mango, avocado, banana, pineapple, orange, lemon in the transition zone as high value product for domestic market and export market
- Promote production of spices such as Ethiopian cardamom, turmeric, ginger, long paper, and black pepper
- Support modern beekeeping, poultry and animal fattening
- Promote cattle, sheep and goat, and supply of forage and veterinary medicine
- promote supply of improve coffee, fruit, and spices varieties
- Support value chain development for honey, coffee, fruit and spices

7.2 Five-year management goals related to agriculture and livestock management

- Goal 1: To benefit 1000 households from the improved crop varieties, modern beehives and provide goat as per their preference;
- Goal 2: To promote production of vegetables and spices among 100 farmers as demonstration site;
- Goal 3: To establish or strengthen 5 primary cooperatives (3 honey producer and marketing cooperatives, 1 coffee producers and marketing cooperative, and 1 multipurpose primary cooperative)

Activities

- To distribute improved varieties of staple crops such as maize and sorghum to improve food security of the local households
- To demonstrate and provide improved vegetable and fruits varieties and production
- To support demonstration and supply of modern beehives and other modern beekeeping equipment
- To support value chain development of local fruit and honey by linking producers to processors, and consumers at central market
- Distribute 200 female and 50 male improved breed of goats to resource poor local households
- Organize women and youths in group and provide vegetables and spice seeds in collaboration with Tepi Agricultural Research Center.

8 FORESTRY

Management context

Forests and woodlands cover over 70% of the total area of Majang zone. The biosphere reserve area is home for one of the few remnant natural forests in the country and represents a unique (transitional forest) forest type; floristic and faunal diversity including endemic species. The biosphere reserve is home for about 27 endemic plant species and several endemic species of amphibians, reptiles and mammals. The biosphere reserve is part of a threatened ecosystem globally recognized as a biodiversity hotspot (National Biodiversity Strategy and Action Plan).

The local communities in and around the biosphere reserve are highly dependent on the forest resources for their livelihood. Several studies reported increasing anthropogenic pressures on forests and unsustainable resource use in the Majang Forest Biosphere Reserve due to forest conversion to settlements and agricultural land, and forest modification by timber extraction and management for coffee production (Reusing 2000; Senbeta & Denich 2006; Schmitt et al. 2009). All these pressures have been resulted in losses of forest resources and ecosystem degradation. Loss of forests also leads to loss of biodiversity, especially those range restricted endemic species and globally threatened species of plants and animals.

8.1 Desired outcome and Strategies

The desired outcome for the forest related management interventions of the biosphere reducing the human pressure on the natural forests through implementation of schemes designed for conservation of biodiversity rich sites; creation of livelihood options for sustainable development; promotion of sustainable forest management; sustainable NTFP development and extraction and establishment of fuel wood plantations.

The management should consider alignment of the proposed management actions with global sustainable forest management goals including biosphere reserve objectives; National strategies and goals (Ethiopia's Biodiversity Strategy; Ethiopia's CRGE strategy and REDD+ goals; and Ethiopia's Growth and Transformation Plan (GTP II) for the forest sector).

Since forests are the key habitats in the biosphere reserve, management strategies and actions related to forests in the three biosphere reserve management zones are described below

Core areas- forest management strategies and actions

The management strategies for core areas forest management are putting in place a protected biodiversity conservation area; promotion of non-intrusive NTFPs (spices, wild edible fruits) extraction and enrichment planting; and establishing research plots and demonstration sites.

Actions

- Demarcation of boundary lines between core areas and buffer zone with marks that are easily identifiable (eg. Exotic trees at fixed distances) and coordinate points for monitoring

- Develop guidelines for wild collection in the biosphere reserve, i.e., collection of non-timber forest products such as spices, wild edible fruits and wild honey.
- Enrichment planting in disturbed parts within the core area using indigenous species
- Establishing research plots and demonstration sites

The management strategy for forests in the **buffer zone** of the biosphere reserve is to **promote an integrated development of NTFP production and management for livelihood improvement**. This includes, environmentally-friendly coffee production, promotion of sustainable beekeeping practices; and extraction and domestication of non-timber forest products (spices, wild edible fruits and climbers).

Actions

- Increase the sustainable production of honey through improved and modern processing, packaging and marketing
- Improve sustainable forest coffee production through sustainable shade trees and coffee stand management, processing, storage and marketing
- Promote and increase sustainable spices production, processing and marketing
- Improve and increase medicinal plants production and marketing, respecting the current bio-cultural protocol
- Certify non-timber forest products (NTFPs) as organic produce from the Mejang biosphere reserve

The second management strategy for forests in the buffer zone is sustainable forest management and restoration of degraded forest lands. This includes implementation of participatory forest management, and reforestation of degraded forest lands through enrichment planting with native tree species.

Actions

- Set up participatory forest management mechanisms (PMM) in the buffer zone
- Ensure sustainable coffee, honey and spices production in the buffer zone, especially in degraded areas
- Audit/monitor coffee plantations to ensure that they have a number of shade trees equal or superior to 1250 trees/Hectare, with not less than 150 different species/Hectare
- Identify and delineate disturbed/degraded ecosystems and habitats
- Reforest degraded forests with indigenous species

The management strategies for forests in the **transition area** of the biosphere reserve include (i) p**romotion of sustainable biomass energy production and use; (ii) sustainable forest management and promotion of native species plantations; (iii) implementation of environmentally-friendly NTFP production/management; and (iv) Set up mechanisms for payments for ecosystem services (PES).**

Actions

- Reforest areas with fast growing tree plantation and sustainably manage them for fuel wood and charcoal
- Support the production and distribution of efficient fuel-wood saving stoves
- Explore the potential of and, if appropriate, develop biomass briquettes (especially from coffee husk)
- Develop tree plantations that provide woods for construction and other purposes (fencing, utensils, etc.), especially in degraded areas
- Develop tree plantations, timber-processing and storage activities for coffins' production

- **Sustainable forest management and promotion of native species plantations**

Actions

- Implementation Participatory forest management
- Development of forest plantations with native species, multipurpose native and exotic tree species for a range of services including fuel wood demand and management (collection of fire/fuel wood from dead trees)
- Sustainable coffee production (through proper coffee management)

- **Functionalize environmentally-friendly NTFP production/management**

Actions

- Promotion of eco-friendly traditional NTFP extraction
- Domestication and sustainable production, processing and marketing of spices, honey, wild edible fruits, medicinal plants;
- Increase the sustainable production of wild honey through improved and modern processing, packaging and marketing
- Improve and increase medicinal plants production and marketing, respecting the current bio-cultural protocol
- Certify non-timber forest products (NTFPs) as organic produce from the Mejang biosphere reserve for improved livelihood income and reduced deforestation

- **Set up mechanisms for payments for ecosystem services (PES)**

Actions

- Explore the potential for and develop (if appropriate) carbon trading mechanisms and projects (e.g. Forest Management Certification, REDD+ mechanisms)
- Explore the potential for and develop (if appropriate) payment mechanisms for water-shed services
- Explore the potential for and develop (if appropriate) payment mechanisms for biodiversity conservation

8.2 Five-year management goals related to the forestry sector

- **Goal 1**: Boundaries of core areas and transition zones clearly marked and conservation measures enforced.
- **Goal 2**: Reducing deforestation in the biosphere reserve by 50%
- **Goal 3**: Reduced forest disaster risks (fire, disease, pest) through proper management and monitoring
- **Goal 4**: Significant increase in household income from forest-based (green enterprise) livelihood schemes
- **Goal 5**: Area of forest under participatory forest management will reach 50,000 ha.

9 WATERSHED MANAGEMENT

MANAGEMENT CONTEXT

With high forest cover within the catchment of major rivers that flow into the Gambella wetlands and the Nile River, the forest in the Majang Forest Biosphere Reserve is presumed to be very critical for ecosystem services like: watershed protection, erosion reduction, and climate change mitigation (carbon sequestration) and biodiversity conservation.The forest is part of a key watershed of regional and global importance. The biosphere reserve is drained by rivers namely, *Alwero*, *Gilo* and *Akobo*, which are major tributaries of the White Nile.

The forest resource is also a source of income for the local community (particularly the Majang ethnic group) whose livelihood depends on non-timber forest products (NTFPs) particularly honey production through traditional bee-keeping. Additional NTFPs include coffee and different spices (korerima, cardamom, turmeric, chilli pepper, long black pepper). There is also a growing trend of coffee production by the highlanders, by planting coffee in degraded forest areas (Majang Biosphere Nomination Document). The Majang Forest Biosphere Reserve is also important for the conservation of cultivated landraces of ensete (*Ensete ventricosum*), coffee (*Coffeaarabica*), anchote (*Cocciniaabyssinica*), Oromo-Dinch (*Plectranthus edulis*), Chili pepper (*Capsicum frutescens*), *Dioscorea praehensilis*, Cabbage (*Brassica oleracea*, *B. nigra*).

The management of these forests for the sustenance of the watershed services and a range of other ecosystem services for the local community and beyond presupposes identification of

drivers of deforestation and forest degradation. The management approach should look into addressing these drivers and ensuring a sustainable natural resource management for improved ecological services and livelihoods. In this regard, the management strategies should be designed in such a way that they are aligned with national and regional strategies and programs. Accordingly, the proposed intervention strategies for watershed management with in the Majang Forest Biosphere Reserve management plan are in line with the national CRGE strategy, national forest sector development program (NFSDP); national REDD+ strategy and the sustainable land management program.

9.1 Desired Outcome and Strategies

The implementation of appropriate watershed management activities in and around the Majang Forest Biosphere Reserve will bring about environmental, social and economic benefits. The major desired outcomes of integrated watershed management interventions are,

- Sustainable land management practices scaled up to all areas outside of core areas and buffer zones
- All degraded watershed restored and rehabilitated
- Regenerative/climate-smart agriculture are practiced widely on cultivated areas
- Community livelihoods enhanced along with improved resilience and/or reduced vulnerability

Strategies and actions

Strategy 1: *Create an enabling environment for the promotion of integrated watershed Management*

Actions

- Reviewing and harmonizing relevant legislations, policy and regulatory frameworks to enable sustainable land and water management
- Promote rural land administration and certification for improved tenure security and engagement of small-holder farmers in watershed management activities
- Put in place legal agreements among relevant stakeholders for successful implementation of management activities
- Conduct an assessment of micro-watershed management options for the development of watershed management plans
- Prepare local land use plans for decision making on the best use of the land and its resources for improved, alternative, sustainable and productive development at the grass root level.
- Delineate land use types at the local level to ensure sustainable use of individual plots

Strategy 2: *Implement integrated watershed and landscape management activities*

Actions

- Implement appropriate biological and physical soil and water conservation measures/practices such (e.g. construction of terracing, check dams, water harvesting (e.g. trenching), re-seeding, re-vegetating, etc. in selected sites in farmlands

- Construction and rehabilitation of communal access roads and paths to nearby markets to ensure transportation of agricultural products
- Introducing variety of plant species including fodder crops into pasture and rangelands to increase their productivity and to ensure the overall calorific value of feed for grazing animals
- Identification of endemic and endangered local plant species, collection of seed and planting material as well as local varieties and accessions, multiplication of genetic material, in-situ conservation at individual farm and local level, establishment of community gene banks, and nursery establishment.
- Apply conservation agriculture with trees (CAWT) and promotion of different shade trees in the coffee and spice farming system.

Strategy 3: *Improved social and environmental benefits through implementation of payment for ecosystem services*

Actions

- Assess the potential ecosystem services (e.g. biodiversity, water, organic coffee) and analyze the potential markets (compliant and voluntary) for these services
- Develop the legal framework and institutional arrangement for functionalizing payment for ecosystem services
- Creating income from REDD+ implementation and design a fair and equitable BSM for channeling benefits to community

Strategy 4:*Capacity development, knowledge generation and management*

Actions

- Conduct regular training events to enhance capacity of local communities and other relevant stakeholders on selected themes (e.g. climate smart watershed and landscape management/protection; biodiversity and ecosystem protection);
- Generate and share knowledge across the broad spectrum of stakeholders to enhance knowledge and information regarding adoption of sustainable natural resource management.

9.2 Five-year management goals related to watershed management

Goal 1: Payment for ecosystem services will be operationalized and contribute to improved household income

Goal 2: Sustainable land management will be implemented in all cultivated areas

10 COMMERCIAL FARMS MANAGEMENT

MANAGEMENT CONTEXT

In Majang zone, the number of commercial farms and their area coverage is increasing. Up to now, over 16,000 ha have been given for commercial agriculture investment, of which most have already been developed and some conducting land clearance. Most of these agricultural developments are through conversion of forest or dense woodland. They also lack proper EIA. The major crops produced by these farms are coffee, sesame, tea, and maize. Except coffee, other crops require total land clearance. They also use lots of chemical inputs to boost production and control pests and diseases. This has impact on the bee population, and the livelihoods of the local community dependent on beekeeping.

10.1 Desired Outcome and Strategies

The **desired outcomes** regarding commercial farms:

- Ensure that existing farms comply with the sustainable development practices of the Majang Forest Biosphere Reserve, adopting Conservation Agriculture principles;
- Ensure that new investment in commercial farms pass through rigorous social and environmental impact assessment and fulfil requirements of Conservation Agriculture Principles before land allocation;
- Most investments are on value addition to the agricultural products that are produced by smallholder farmers and encourage out-grower schemes rather than directly engaging in raw materials production.

The **strategies** to be followed:

- Identify potential areas for agricultural investment through strategic environmental assessment (SEA) of the Majang Zone;
- Conduct EIA and strictly adhere to recommendations, through proper monitoring and law enforcement
- Adopt Conservation Agriculture Principles.

10.2 Five-year management goals related to commercial farms

Goal 1: Criteria and indicators for good conservation agriculture practices for different cropping systems in Majang Forest Biosphere Reserve Developed and adopted (for both commercial and smallholder farms)

Goal 2: Existing commercial farms adopt Conservation Agriculture on at least 30% of their farm land.

Goal 3: The type of agricultural investments and their potential areas with the biosphere reserve are identified and mapped, till the maximum of 10% of the total land area of Majang zone is reached (existing and planned commercial farms)

Goal 4: Limit agricultural investment to the identified areas, and those that pass through rigorous social and environmental impact assessment.

11 CLIMATE CHANGE ADAPTATION AND MITGATION MANAGEMENT CONTEXT

The livelihood of rural community in the Majang zone is primarily agriculture and forest-based. A large portion of the population, in the high lands depends on agriculture while those communities in the low lands are highly dependent on forest resources (Metu-Tepi University).

Climate change (CC) will have severe impacts on communities whose livelihood is dependent on natural resources owing to their limited resilience capacity. On top of that, climate change will impact on the ecosystem (including forests) functioning through its effect on components and processes and its resilience to extreme climate impacts. The lowland dry peripheral semi-deciduous Guineo-Congolian forest (often referred as transitional forest) is restricted to southwestern corner of the country, and covers only a small portion of Gambella Regional State. As noted in chapter 10 of this document, the forest ecosystem possesses restricted plant species (e.g., *Baphia abyssinica*, *Antiaris toxicaria*, *Alstonia boonei*, *Celtis integrifolia*, *Milicia excelsa*, and *Pouteria alnifolia*) and is recognized as part of Ethiopian biodiversity hotspot (Ethiopian Panel on Climate Change, EPCC, 2015).

The management context with regard to climate change mitigation and adaptation should take into consideration a number of issues related to local community and environmental setting, and the contribution of the biosphere to regional and national adaptation and mitigation goals.

11.1 Desired Outcome and Strategies

The successful implementation of the management strategies with regard to climate change adaptation and mitigation will bring about the following desired outcomes:

- The biosphere reserve will contribute significantly to the social and ecological resilience at local and regional level
- The biosphere reserve will contribute significantly to regional and national emission climate mitigation (emission reduction/carbon removal) goals.
- The local community will become less vulnerable to climate change impacts and risks
- It will also contribute to the country's commitment meet international conventions like the UNFCCC, CBD, CCD.

Strategies and actions

The management strategies are meant to reduce the vulnerability of the community to CC impacts and risks; improve the level of awareness and adaptation capacity of the community; and integration of traditional CC adaptation mechanisms in the wider adaptation plans. On the other hand, the strategies that are to be implemented in the Majang Forest Biosphere Reserve should be aligned with the local, regional and national strategies and goals including improving community livelihood, conserving biodiversity, reducing emissions from land use sectors. In short, the management interventions should be holistic for improved landscape and community resilience to CC impacts and risks. The following *strategies* and *actions* should be put in place for achieving the desired outcome with regard to climate change adaptation and mitigation:

Strategy 1*: Implementation of adaptive measures for enhanced social and environmental resilience*

Actions

- Exploring and analysing local climate change (CC) adaptation practices, skills and institutions
- Identification and integration of local climate change adaptation practices, skills and institutions into the modern climate change adaptation schemes
- Exploring and integrating cultural/traditional forest management systems(e.g, "*Jang*" and "kobbo'') into the modern forest management plans
- Continuous awareness creation on CC impacts through a diversity of mechanisms
- Building community capacity for enhanced resilience through household livelihood improvement

Strategy 2: *Putting in place a system for improved CC impact monitoring and management*

Actions

- Mapping and assessment of CC risks as an important aspect of adapting to climate change
- Monitoring and management of disturbances such as fires, land use change, settlements, pests, and diseases.
- Exploring and developing community-based (participatory) CC risk monitoring
- Explore, identify and integrate traditional CC impact management mechanisms into a modern CC management schemes

Strategy 3: *Enhance climate and social benefits of the biosphere reserve through regional REDD+ program and payment for ecosystem services*

Actions

- Analyze the options for integrating the biosphere reserve into the regional REDD+ program
- Put in place appropriate legal and institutional framework for implementation of REDD+ program
- Identify the major drivers of deforestation and forest degradation (DD) and the strategic options to address those.
- Implement targeted interventions aimed at reducing emissions from DD and enhancing forest carbon stocks

- Adopt a fair and equitable benefit sharing mechanism (BSM) for channeling incentives to community

Strategy 4: ***Promotion of climate smart agriculture and livestock production and management***

Actions

- Adoption of climate smart agriculture and controlling shifting cultivation
- Implementation of sustainable land management
- Introduction of improved cattle varieties and improving fodder production

Strategy 5: ***Promotion of sustainable biomass fuel and alternative energy production and use***

Actions

- Establishment of fuel-wood plantations from short-rotation forestry of selected tree species
- Provide awareness creation on energy-efficient stoves and sustainable biomass fuel (including biomass waste energy e.g. briquette)
- Provide skill development training to communities for the production of energy-efficient cook stoves and sustainable biomass energy production
- Establish community enterprises for mass production and sell of biomass energy from waste and energy efficient technologies
- Develop a scheme for financing community enterprises to support technology production

11.2 Five-year management goals related to climate change adaptation and mitigation

Adaptation to climate changes refers to adjustments in ecological, social, and economic systems in response to the effects of changes in climate (Spittlehouse and Stewart 2003). According to Smithers and Smit (1997) two broad kinds of adaptation measures: measures that aim to buffer a system from disturbances by increasing its resistance and resilience to change, and measures that facilitate a shift or an evolution of the system towards a new state that meets altered conditions. On the other hand, mitigation measures primarily aim at reducing greenhouse gas (Carbon dioxide) emissions from forest conversion and degradation on one hand and increasing carbon removal through afforestation, reforestation and landscape restoration. To this end, the short-term management goals for Mejang biosphere reserve aims at achieving building adaptive capacity of the community, building landscape resilience and reduce carbon emissions from land uses while increasing landscape carbon storage.

5-year goal 1： The local community will better adapt to climate change impacts and risks through improved adaptive capacity and livelihoods.

5-year goal 2: The biosphere reserve will contribute significantly to the social and ecological resilience at the local level and to the regional and national goal of carbon emission reduction and/or storage.

12 URBAN DEVELOPMENT

Management Context

Urbanization is at its infant stage in Majang zone. The only major urban area is Meti town, the zonal and Godere Woreda capital. Mengeshi is another emerging Woreda capital town. For urban development, having appropriate structural development plan that addresses historical, socio-economic, spatial and environmental aspects of urban centres, as well as urban-rural economy linkages, physical characteristics of urban surroundings, and the road network.

All towns and rural settlement areas are connected with poorly maintained gravel roads. Using the infant stage of urban development as opportunity, it is important implement development plan that has due consideration for green space, environmental protection (waste management) and infrastructure.

12.1 Desired Outcome and Strategies

The desired outcome regarding urban development is to have a vibrant economic development with a clean, liveable environment and healthy citizens.

Strategies to develop green urban environment are:

- Develop urban plan for Meti and Mengeshi town, integrating the ‘green’ city concept and local socio-economic and cultural contexts;
- Improve the quality and cleanness of the towns through improved waste management;
- Establish a system for solid waste collection, processing and recycling, primarily in Meti town and extended to other major settlements in Majang.

12.2 Five-year management goals related to urban development

Goal 1: Urban development plan finalized for Meti and Mengeshi town;

Goal 2: All urban infrastructure developments comply with urban development plan;

Goal 3: Foster economic development by attracting 3-4 new hotels & tourists to the area.

13 TOURISM

MANAGEMENT CONTEXT

Majang is endowed with many natural attractions. But, it is not among known tourist destinations in the country. In resource dependent community, creating an opportunity for sustainable and diversified economic activity is crucial for both human community and the natural environment. The Majang Forest Biosphere Reserve management also promotes this

to ensuring sustainable development in the region while protecting the natural environment. Community based ecotourism is one of the approaches to achieve this objectives.

13.1 Desired Outcome and Strategies

15.1.1 Desired Outcome

The successful implementation of the management strategies with regard to sustainable nature based tourism/ecotourism will bring about the following desired outcomes:

- The socio-economic wellbeing of the local community (the indigenous tribes and highlanders) will be improved through a diversified economic opportunities created as a result of community based ecotourism business.
- The cultural assets of the local community shall be preserved.
- There will be an increased interest by locals to protect the natural environment since it becomes the source of tourism products and services.
- The importance of the Majang Forest Biosphere Reserve shall be promoted locally, regionally, nationally, and globally.
- Increase the resilience capacity of the local community mainly those section of community highly resource dependents.

13.1.1 Strategy

Nature based tourism/ecotourism is one of the potential economic sectors that can benefits local communities in the Majang Forest Biosphere Reserve without impacting the natural environment. The ecotourism business need to be designed in such a way that it will be sustainable ensuring the benefits of local communities, and fulfilling one of the objectives of the Biosphere Reserve, sustainable development.

Based on Kayat 2014 study, several components have been identified as a criteria/strategy of sustainable community based tourism that can be adopted to the Majang Forest Biosphere Reserve. These components can be clustered into five dimensions namely *community involvement, empowerment and leadership*; *benefit to community*; *collaboration and networking*; *marketing and promotion*; and *conservation.*

A. Community Involvement, Empowerment and Leadership

Members of the local community as a group shall be the main actors in creating sustainable ecotourism program/product as the existence of the tourism activities is often initiated by a group of people willing to be involved and participate in the process and operation of rural ecotourism activities in their community. Firstly, prior to the setting up of a community based sustainable ecotourism program/product in Majang Forest Biosphere Reserve, community capacity building must be executed to ensure that they have enough understanding, capability and motivation to develop a sustainable community based ecotourism products.

In addition, leadership and the commitment to achieve the goals of sustainable ecotourism is one of the critical factors for developing community based ecotourism program in Majang Forest Biosphere Reserve, as it needs the full commitment from the programme leader or coordinator as well as from the local community involved. Along with the above criteria, community members' direct involvement in any tourism development project can empower the community economically, socially and politically. The active involvement and participation of residents in the tourism development process is therefore, a prerequisites for

achieving the goal of sustainability and thereby improving the overall welfare in the community. However, in order to build the communities' capacity, it requires commitment from a wide range of stakeholders including from the government and public sector as well as from the community. This means, all parties involved in developing the sustainable ecotourism program have to become participatory, responsive, and transparent. The ultimate objective should be to ensure the local community not to be dependent on the assistance and financial support from the government or NGOs especially in terms of promotion and marketing.

B. Benefit to the Community

The community based ecotourism shall be sustainable if it produces net positive benefit to the community. Therefore, the goal for community based ecotourism development in the Majang Forest Biosphere Reserve should be to improve the communities' level of economic, social and environment. Example of benefit includes the creation of community resources such as *health services*, *education and infrastructure* for the community itself. In addition, community based tourism must benefit all stakeholders involved for it to last. The benefit enjoyed by the local community usually comes in the form of financial and non-financial. Subsequently, community based ecotourism in a rural setting like Majang could actually increase the opportunities for social contact and exchange among the local community with the visitors. If the program implemented well, community based ecotourism also benefit the community in non-economic terms as it focuses on the protection and preservation of local nature and cultural heritages.

C. Collaboration and Networking

It is fundamental for the Majang community based ecotourism program to attract, create and sustain the demands for its program. It must establish collaboration and networking with all relevant players in tourism industry. Collaboration is critical to get the support the program needs to enhance its resources and facilities. At the initial stage, the local community could only become active participants if they have support from the government, private sector and NGOs to enable the skills and knowledge transferred to them. For example, training for local tour guides is critical as there are evidences from other areas that well trained local tour guides with good communicative power in representing and interpreting the cultural heritage would have direct and potentially significant influences to the visitors. Other specific training programs focusing on skill development, business planning and marketing specific to the needs of entrepreneurs are important. Additionally, products and tourism committee may also need to be facilitated by external trainers who are engaged or connected through networking.

D. Marketing and Promotion

With the support of NGOs, government and other stakeholders, the community based ecotourism in the Majang Forest Biosphere Reserve shall develop efficient marketing strategy to enable the local community create awareness about their products and services to their potential visitors as well as to expedite the visitors in making the decisions to visit their area. Such approach helps to sustaining their tourism business operation. For areas like Majang, the marketing strategy should focus on niche tourism marketing with the venture segment in mind and with the venture visitors as their target segment. This could be done through the advertising and promotional opportunities available online, in tourism-related magazines, and at the state travel information offices where most tourists tend to obtain travel-related information.

E. Conservation

In a place like the Majang Forest Biosphere Reserve, visitors come for the uniqueness of experience, so it is crucial to have the vast indigenous forests and community's way of life associated with the natural environment/forests protected. Conservation of the natural forests in Majang has to be considered as one of the main characteristic of sustainable tourism development, which is one of the desired outcome for the Majang Forest Biosphere Reserve. The concept of conservation in the context of Biosphere Reserve includes not only the protection of the natural environment but also refers to the preservation of the cultural assets of local communities and the heritages in the area that represents the identity of the tourism place.

Therefore, based on the five components described above, as five year strategy to ecotourism development, the following actions must be executed:

Putting in place the necessary tourist facilities and other infrastructure in places identified as potential tourist attractions (both natural and cultural).

Actions	Description of actions	Implementing zones CZ)(BZ) (TZ)
Action 1.	Build road network and visitors accommodations (Lodges and restaurants)	BZ TZ
Action 2.	Build/Establish visitor center in identified area	TZ
Action 3.	Build nature trails and camping grounds in selected sites	BZ TZ

Build community capacity to provide standard service

Actions	Description of actions	Implementing zones CZ)(BZ) (TZ)
Action 1.	Form a group of community members to engage in ecotourism business	
Action 2.	Train members of community involved in community based ecotourism in the following key skills: marketing, as tour guide and interpreter, awareness creation techniques, leadership, financial management and networking.	
Action 3.	Collaborate with private investors in the sector (e.g., tour operators, promotors, airliners, etc) through public-private partnership to promote the local attractions and increase visibility.	

Enhance the development of eco-tourism, in collaboration with other biosphere reserves and areas

Actions	Description of actions	Implementing zones CZ)(BZ) (TZ)
Action 1.	set up a working group on eco-tourism with other biosphere reserves	TZ
Action 2.	establish a touristic itinerary allowing to visit natural and cultural sites as well as local communities	BZ TZ
Action 3.	promote (local) investments in eco-touristic infrastructures on the itinerary	TZ

Action 4. publicize/brand the itinerary to tour operatorsTZ

Action 5. monitor the sustainability of touristic activities

in the biosphere reserveBZ TZ

Indicators that can be used for monitoring and evaluating the implementation are:

- working group established between the BRs
- itinerary(ies) established
- number and type(s) of eco-touristic infrastructures
- number of tourists
- number of households benefiting from eco-touristic activities
- income generated by households in charge of eco-touristic activities

If properly implemented, the outcome of this objective at the end of the MP will be:

Outcome: The eco-tourism sector is developed for the benefit of local communities and its activities respect and promote the local natural environment.

13.2 Five-year management goals related to tourism and public awareness creation

The global trend shows that nature based tourism/ecotourism is expected to grow in the coming years. This will create a good opportunity for places like Majang where community managed tourism benefits if proper marketing and promotion is done.

Community based tourism is increasingly being used as a development strategy to improve the social and economic wellbeing of rural areas. This is because it encompasses a huge range of activities, natural or manmade attractions. Community based tourism offers a diverse opportunities to a local socio-economy. Its contribution can be expressed not only in financial terms, but also in terms of jobs, contributions towards funding conservation, encouragement to the adoption of new working practices, and the injection of a new vitality into sometimes weakened economies. Potentially community based tourism delivers some of the following benefits to rural development: *job retention, job creation, new business opportunities, opportunities for youth, service retention, community economic diversification, preserve rural culture and heritage, landscape conservation, environmental improvement, etc.*

In this regard, the short-term management goals for Majang Forest Biosphere Reserve aims at achieving a sustainable development through economic diversification and building the capacity of local community.

Goal 1: Through community based ecotourism, the Majang Forest Biosphere Reserve will contribute primarily to the socioeconomic wellbeing of the local community, and also to the region and the country at large.

Goal 2: As a result of diversified economic activities the pressure on the forest will decline as the degree of direct forest resource use or dependency by the local community reduced.

Goal 3: Increase appreciation of the importance of the Majang Forest Biosphere Reserve for its contribution to sustainable development in the area.

Goal 4: There will be an increased awareness about the Majang culture and tradition and the uniqueness of the natural environment in the area at national and global level.

14 EDUCATION FOR SUSTAINABLE DEVELOPMENT

MANAGEMENT CONTEXT

As defined by the Statutory Framework of the world nature and biosphere reserve (WNBR), an important objective of biosphere reserves is their role in education and research. Accordingly, the management approach for Majang Forest Biosphere Reserve should improve the knowledge of the interactions between humans and the biosphere. For that, the biosphere management need to promote knowledge and education for sustainable development at local and national level. In accordance to the framework for WNBR and aligned with the recommended management guideline for Majang biosphere, educational activities can be planned largely in the buffer and transitional zones although some educational activities are allowed in the core zone.

In designing the educational activities as part of the management plan, the key inputs include the type/scope (general, cultural heritage, technical) of information/knowledge; the target groups to be addressed; knowledge transfer mechanism including the materials required. In this regard, it is important to identify the places and the means for diffusing information using appropriate partners such as schools and universities, in-service training specialists, government administrative bodies, tourism specialists, etc. The Majang Forest Biosphere Reserve has a great potential as a demonstration site for environmental education and the link between culture and biodiversity or cultural biodiversity (Nomination Document). Currently, there is an on-going environmental education program, targeting youth and community, members, especially elders. MELCA Ethiopia has been implementing an environmental education program called SEGNI (Social Empowerment through Group Nature Interaction).UNESCO has selected the SEGNI program of MELCA Ethiopia as one of the few good practices worldwide for successful education and learning initiatives that articulate strong links between cultural, socio-economic and environmental aspects of sustainability.

The implementation of educational activities under this management plan should strengthen and expand the SEGNI program along with the implementation of a range of interventions.

14.1 Desired Outcome and Strategies

It is envisaged that the management interventions with regard to education for sustainable development will,

- Create strong awareness on the social, economic and environmental significance of the Majang biosphere among a range of stakeholders
- Build the capacity of relevant stakeholders (in terms of knowledge and skill)enabling them to actively engage in the sustainable management biosphere resources.
- Ensure the integration of environmental education in school curricula to raise awareness, enhance knowledge and shape the attitude of students on the importance of the Majang Forest Biosphere Reserve in sustainable development.

To achieve these outcomes, the following sets of strategies and actions are implemented

Strategy 1: Strengthen environmental education & public awareness raising at a large scale

Actions

- Conduct inventory of environmental education and training activities for adults, children/youth and resource users.
- Promote environmental education at all levels, including school children, government officials and community, including the SEGNI program of MELCA.
- Organize environment related events in schools, Universities and among communities
- Develop modules on environmental education in collaboration with primary and secondary schools and work towards its integration in school curricula.
- Establish collaboration with selected Universities whereby the biosphere reserve can be used as a learning ground to advance scientific knowledge and the universities provide technical support on the management of the biosphere reserve
- Set up exchange visits for students and community members with other areas of the country where good conservation practices are promoted
- Disseminate information (in local languages) on Majang Forest Biosphere Reserve in a form of fliers and brochures
- Work with the regional bureau of mass media to outreach wider stakeholders through community radio programs

Strategy 2: Support and build stakeholders' capacity for sustainable management and development of the biosphere reserve

Actions

- Raise awareness and provide short-term trainings to local officers on existing environment, forest, natural resource and community right related legislations for better enforcement
- Provide short-term (but continuous) trainings to local officers and experts on participatory resource mapping, delineation and management, and monitoring.
- Train local officers and community members to ensure the monitoring of forests and other habitats/ecosystems
- Design and implement skill-building training to community members on the sustainable use and management of NTFPs, particularly honey, coffee, spices and others resources
- Train local community members on sustainable farming practices, the use of alternative sustainable energy sources and energy saving technologies

Strategy 3: Establish an educational center

Actions

- Conduct a round of discussions with communities, elders, community leaders, relevant government offices, CSOs on the identification traditional knowledge; cultural and historical heritages; natural heritages of the region and the biosphere reserve
- Create consensus on the authenticity of the knowledge, practices, heritages and resources among recognized authorities

- Setup and run an educational center through consultation and participation of relevant actors.

14.2 Five-year management goals related education for sustainable development

Goal 1: Implementation of the flagship environmental education- SEGNI in all schools within the biosphere reserve

Goal 2: A strong linkage will be established between nearby Universities and the biosphere reserve so that the latter serves as a learning ground for students while the universities provide an active and sustained technical support in the management of the biosphere reserve.

Goal 3: An educational centre will be established that informs on the rich natural and cultural history of the region and the significance of the Majang Forest Biosphere Reserve in sustainable development.

15 RESEARCH, MONITORING, AND EVALUATION

15.1 Basic research principles in biosphere reserves

Biosphere reserves are internationally recognized areas where conservation and sustainable development objectives are reconciled, and where environmental education and awareness raising, training, research and innovation are critical elements contributing to the success of such an approach. Long-term research activities, monitoring, and evaluation for adaptive management and supportive national conservation policies are integral part of biosphere reserve management and determine its success (Stoll-Kleemann and Welp, 2008). According to the Seville strategy, biosphere reserves typically provide ideal sites for monitoring changes in the physical and biological components of the biosphere (UNESCO 1984). Their protection and scientific mission make biosphere reserves particularly attractive sites for gathering scientific information (MAB, 1984).

Research undertaking, specifically non-destructive research, is permissible in the core zone(s) while applied and basic research can be conducted in the buffer and transition zones. Research in the context of biosphere reserve should generate knowledge, solve problems and paves the way for evidence-based intervention in the conservation of biological diversity, sustainable resource use and in improving ecosystem resilience to impacts including climate change. In fact, research interventions in individual biosphere reserves need to identify the challenges and gaps as part of the long-term management activity.

Research themes should be holistic and/or interdisciplinary in addressing the social, economic and environmental challenges. On top of that, for rational use of research and monitoring results in the management of biosphere reserves, the development of a functional system of data management need to be an integral part of the research undertaking. An equally important consideration is that the issue of integrating biosphere reserves with national and regional scientific research programmes. In this regard, it is important in linking the research activities with regional and national policies on conservation and sustainable

development. On the other hand, the international network provides a framework for comparative studies of similar problems in different parts of the world; for testing, standardizing and transferring new methodologies; and for co-ordinating the development of information management systems (UNESCO, 1996).

15.2 Research in south-western forest area

In 1960s and early 1970s, on the history and culture of the Majang people (Stauder 1970 and 1972).

In the 1970s, 1980s and 1990s, several independent studies on the biodiversity of the forest vegetation and wetlands were conducted by different individuals and institutions (Chaffey 1979; Friis 1979, 1983, 1992). Gole and Senbeta (2007) conducted studies on the forest biodiversity and traditional management practices in Majang. Similarly, the changes in forest cover and main drivers were assessed by different researchers, including Wakjira et al (2007), Sherefa (2006) and Gole and Ilfata (2013). The livelihood of the local communities was also documented in some resent studies (Seyoum and Gole 2010, 2011; and Gole and Ilfata 2013).

15.3 Research in the Biosphere Reserve

The biosphere reserve has a great potential as a demonstration site for environmental education and the link between culture and biodiversity or cultural biodiversity. MELCA Ethiopia is implementing an environmental education program called SEGNI (Social Empowerment through Group Nature Interaction). The overall objective of MELCA's SEGNI program is to connect the youth in schools with culture, nature and self by way of intergenerational learning with the intention of creating, in the youth, a sense of responsibility for the conservation of their cultural and ecological resources. The program creates a platform of interaction between the youth and elders, by staying in wilderness for 5 days, and where the youth experience nature and culture as well as related environment and natural resource conservation mechanisms from elders to connect with themselves. UNESCO has selected the SEGNI program of MELCA Ethiopia as one of the few good practices worldwide for successful education and learning initiatives that articulate strong links between cultural, socio-economic and environmental aspects of sustainability. SEGNI is highlighted as a case in good practices compiles in "Linking Culture, Education and Sustainability: Good Practices and Experiences from Around the World". Several awareness raising trainings for community members, leaders, experts and local authorities were also conducted as part of environmental education for adults. The area has a great potential to serve as biological field station for the newly established universities in the area, especially for Mizan-Teppi, Mettu and Gambella Universities, located within short distance of the proposed biosphere reserve. The Teppi Agricultural Research Center, mainly focusing on spices, and the Gambella Agricultural Research Center are also located in the area, and are engaged in applied research to generate agriculture related technology generation.

Due to its relative distance and poor access, there was little research in the area. Over the past few decades, however, it has attracted researchers from different disciplines. Botanists have been frequently collecting and describing species from the area since 1970s (Friis et al. 1982). There is a growing research interest and activity over the last decade. Some of the recent research works in the area include:

- Studies on livelihoods of the area (Seyoum and Gole2010) and NTFPs value chain (Seyoum and Gole2011)
- An inventory of forest resources in the area (Gole and Senbeta 2006)
- Agricultural research on major crops, coffee and spices by Gambella and Teppi Agricultural Research Centers.
- Trends of deforestation in the area (Muzein 2001; Wakjira et al. 2008)

Monitoring of changes in forest cover, forest conditions and biodiversity is important for sustainability. MELCA Ethiopia, in collaboration with government agencies and other stakeholders initiated monitoring activities. The initial GIS and remote-sensing assisted forest cover change and associated changes in culture and biodiversity was conducted by MELCA Ethiopia (Gole and Ilfata 2013). MELCA has also introduced participatory eco-mapping and 3D mapping exercises as tools to monitor changes in the area. Participatory 3D mapping was conducted for the whole Majang zone in 2014. During the mapping process, various natural, settlement and other human dominated landscapes were located and mapped. These include cultural sites, mountains, rivers, waterfalls, forest, coffee farms, lake and major villages and towns.

In 2014 and 2015, MELCA revised the land use and land cover map of the area using high resolution RapidEye satellite image, as a baseline for future changes monitoring. Please see Annex 7 for details. Figures are given for each of the land cover classes distributed along the proposed biosphere zones and administrative boundaries.

Research potential of the Biosphere

The Teppi Agricultural Research Center (TARI) is permanent national center with excellence in spices, located in the neighboring Yeki woreda in the SNNP regional state. The center is conducting research on domestication and propagation of various local spices like Korerima, Long Black Pepper, etc. TARI is also conducting adaptation trials and variety selection of coffee, fruit trees and introduced spices like cardamom, turmeric, and vanilla. Different organizations like MELCA Ethiopia are conducting applied research on sustainable natural resources management and conservation of biodiversity. The Gambella Agricultural Research Center is also expected to open sub-office in Meti to and conduct complementary activities with TARI. Different Ethiopian and foreign universities are also engaged in various research activities on the forest, culture and ecosystems of the area. The newly established Gambella, Mizan-Teppi and Metu universities are also expected to launch research in the proposed biosphere reserve. The MU shall approach these universities and other potential partners for collaboration

Gaps in research in the Biosphere

Currently, there is no on-going research activity. Early studies in 1960s and 1970s focused on the history and culture of the Majang people, and the forest vegetation. Several independent studies on the biodiversity of the forest vegetation and wetlands were conducted by different

individuals and institutions. Recent studies since 2000 focused on changes in forest cover and main drivers, and livelihoods of the local communities.

The **benefits of scientific cooperation** are:

• strengthening of the role of science in the region,

• promotion of cooperation among higher educational institutes and different administrative institutions in the region,

• popularization of the goals of the biosphere reserve in the region through scientific activities.

Strategy1: Establishing scientific cooperation with national and international partners

Actions

- set up partnerships & cooperative researches with nearby universities, research centers,
- international organizations and other research projects
- set up research plots on ecosystems, vegetation and species dynamics
- conduct researches on socio-economic, cultural & land-use dynamics
- conduct researches on NTFPs and their value chain, as well as on alternative energy sources
- conduct researches on the effects of, and adaptation to climate change
- conduct researches on the feasibility of payments for ecosystem services
- conduct researches on agro-ecology and sustainable agro-management (e.g. demonstration and research sites on farm)
- create and manage a database to share knowledge on the biosphere reserve(s) accessible for all relevant stakeholders

Desired Outcomes

- The biosphere reserve socio-economic, cultural and environmental aspects are well studied and understood; valuable scientific information are extracted, shared and used for operational projects and for better management of the BR.

15.4 The monitoring programme for Majang Forest Biosphere Reserve

Participatory monitoring using community members, assisted with satellite images are used to detect land use and land cover changes. Socio-economic changes shall be monitored using livelihood indicators based on public opinion.Monitoring as such is an integral part of the biospheres mission in fulfilling their logistics function, providing support for research, monitoring, education and information exchange.

On socio-economic indicators for monitoring

Moldan (2002) Five domains of indicators are mentioned- basic indicators on people and their status:

1. indicators on ecosystem services,
2. indicators on the participation of local communities,
3. indicators on the socio-economic dynamism of a region,
4. indicators on the attitudes of local residents, and
5. indicators on future developments.

The contribution stresses the necessity to monitor biosphere reserves in their specific local and national contexts.

Monitoring

Baseline information based on high resolution RapidEye satellite image (5 m) analysis has been established. MELCA Ethiopia has developed participatory mapping methodologies with the community. Community members and experts have produced a participatory 3D map of the area. Trainings in use of GPS and change detection were conducted to build their capacity to monitor changes in forest and land use condition. Further trainings shall be conducted on management plan of the different biosphere reserve zones and indicators for monitoring. Selected community members shall be trained as para-ecologists to conduct monitoring and identify mitigation measures. MELCA Ethiopia shall continue supporting the implementations of the plan and monitoring of the biosphere reserve for the first 5 years after establishment. Research organizations and universities shall also be invited to provide technical support on monitoring and development of tools for monitoring.

15.5 Monitoring in core areas and buffer zones

Basic monitoring of the development of core areas and buffer zones shall be part of the monitoring programme. Specific monitoring plans, however, should be set up parallel to the preparation of management plans for the specific zones. Herein, the following questions shall be taken into account:

- Are management plans for each zone prepared, communicated, and used by local decision-makers and communities?
- Is land-use in compliance with the management plan, or, in core areas, is the principle of strict protection adhered to?
- Are the enforcement and incentive mechanisms agreed upon efficient and sufficient or is there a need for alteration? This regards e.g. restrictions in land use (e.g. banned grazing in area closures), restricted use of fertilizers, restrictions or bans on use of pesticides, increase share cover and tree species in coffee agro-forests.
- Is monitoring in agreed, conducted at regular intervals to document the success?
- Does the monitoring system consider rare and endemic species, as well as key ecosystem?
- Is the monitoring system participatory and transparent?

15.6 Coordination of the monitoring programme

The Biosphere Reserve Coordination Office (BRCO) is responsible for coordinating all activities related to monitoring and to compile all recorded data. In supervising the monitoring programme, it has to correspond with sectoral departments and offices that are responsible to record data.

15.7 Five-year management goals related to research, monitoring and evaluation

Goal 1: A BR monitoring and evaluation system is operating and at least yearly monitoring reports are published.

16 LEGAL AND INSTITUTIONAL ARRANGEMENT

16.1 Applicable laws for the biosphere reserve management

Management of biosphere reserve has to comply with state, national and international legal and institutional frameworks. There are several state, national and international legal instruments (see the lists under section 2.1, and detailed description in annex Annex 1). Key international legal instruments include- the UNESCO Man and Biosphere Reserve's Seville Strategy (1996) and Madrid Action Plan (2008), as well as the UN Convention on Biological Diversity (CBD). The key relevant national laws include: The FDRE Constitution, the Forest Development, Conservation and Utilization Proclamation, Ethiopian Organic Agriculture System Proclamation, the Access to Genetic Resources and Community Knowledge, and Community Rights Proclamation, as well as flagship national strategies and plans like the Climate Resilient Green Economy (CRGE) strategy and the Growth, Transformation Plan (GTP) and the National Biodiversity Strategy and Action Plan (NBSAP) to the CBD.

16.2 Management Structure for Majang Forest Biosphere Reserve

The management arrangement for the Majang Forest Biosphere Reserve was developed based on the current regional public sector institutional arrangements and legal mandates. The Administration Office at all levels has the role of coordinating and overseeing activities by different sectors. The office also consolidates plans of different sectors, and monitor performances. The management arrangement for Majang Forest Biosphere Reserve will follow similar arrangement.

The management plan is implemented at zone, Woreda and community level within Majang zone. Hence, the Majang Forest Biosphere Reserve Coordination Office (BRCO) is hosted by the Majang Zone Administration Office. The BRCO coordinates activities by implementing sector organizations at zonal level, and also at Woreda level through Woreda Focal Person.

The management structure is shown in Figure 6 below. Sectoral offices are responsible for implementation of management activities within the mandates of their sectors (e.g., agriculture, forestry, watershed management, cooperatives capacity building and the like fall with the manadates of Agriculture and Natural Resources department and office at zone and Woreda levels).

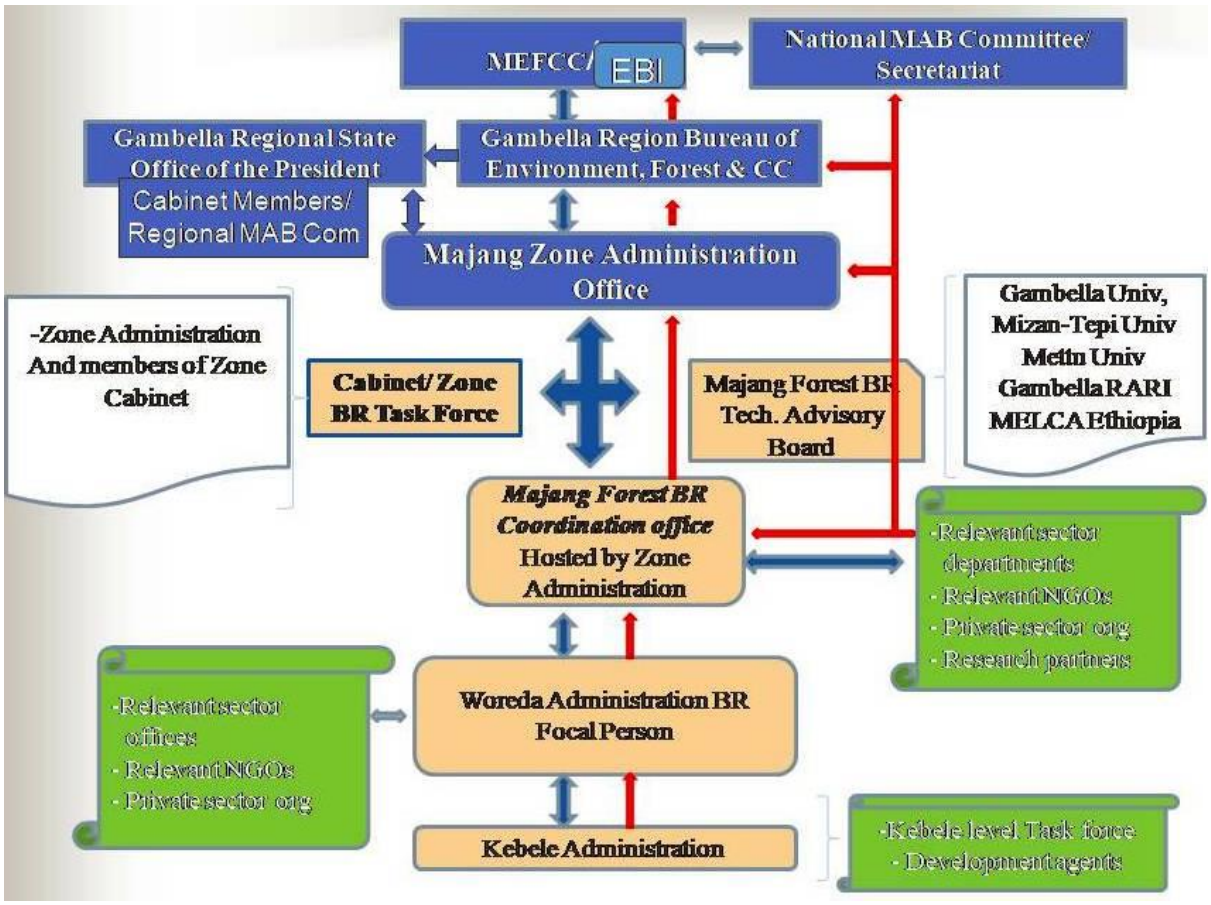


Figure 2. Management structure of the Majang Forest Biosphere Reserve

16.3 National and regional oversight institutions

National level- the National MAB Committee is the highest oversight body at national level. The committee annually reviews reports, facilitates networking among national BRs and with the WNBRs. Key members of the National MAB Committee that have special mandates for detailed follow up include MoST, MEFCC, EBI, MoCT, and MoE.

Regional State level oversight institution is the Office of President of Gambella People' National Regional State. The Gambella Regional State Science and Technology Commission, and Bureau of Environment, Forest and Climate Change and institutions that technically support and follow up performance/ progresses of the biosphere reserve implementation

16.4 Regional state level management institutions and their role

Regional state level institutions mainly allocated budget and oversee performances related to their respective sectors

- Office of the President- overall coordination
- Bureau of Agriculture and Natural Resources- Agriculture, watershed management, and cooperatives related activities
- Bureau of Environment, Forest and Climate Change- forestry, climate change, monitoring, conservation

- Gambella Regional State Science and Technology Commission- research and overall coordination activities
- Bureau of Education- Environmental education
- MELCA Ethiopia- Overall coordination, technical support and resources mobilization

16.5 Zonal level management institutions and their roles

Zonal level: Zone administration, BR Coordination Office, BR Task Force, BR Advisory Board and implementing sectoral institutions and civil society partners. The secoral institutions include Department of Agriculture and Natural Resources, Department of Culture and Tourism, Department of Justice and Security, Department of Water and Mining and Department of Education.

16.6 Woreda level management institutions and their role

Woreda level- Administration and sectoral implementing institutions, including Office of Agriculture and Natural Resources, Office Culture and Tourism, Office of Justice and Security, Office of Water and Mining, and Office of Education.

16.7 Community level institutional arrangement

At Kebele level- the local Task Force is responsible for coordination, monitoring and reporting management activities at Kebele level.

16.8 Coordination

BR Coordination office is responsible for the overall coordination of activities, communication, public relations and information dissemination. The Office is also responsible for networking with other biosphere reserve, establishing partnerships, facilitating experience sharing visit with other biosphere reserve, synthesizing and consolidating reports based on monitoring results.

Zonal and Woreda Administrations also coordinate planning and regular review and performance assessment of sectors within their jurisdiction. The Woreda focal person facilitates coordination and cooperation between different sectors. The focal person is also in charge collating reports from Kebele and sectors at Woreda and report to the BRCO.

17 RESOURCE MOBILIZATION AND COST ESTIMATES

17.1 Sources of finance

The sources of finance for implementation of the management plan are government budget, program budget like the regional REDD+ Readiness Program and Sustainable Land Management Programs, development partners like MELCA Ethiopia and TechnoServe. Currently, MELCA Ethiopia is providing financial and technical resources to support initial pgase implementation through funding from Sida. The Norway funded REDD+ program is also starting this year, 2018, while SLMP is already going on in the zone. The BRCO, MELCA Ethiopia and sector partners shall mobilize additional resources, developing fundable proposals every year.

18 REFERENCES

Abebe, T 2003. The Influence of Selective Logging on Residual Stand and Regeneration in a Tropical Rain Forest in Southwestern Ethiopia.Swedish University of Agricultural Sciences, Umea.

Chaffey D.R. 1979. Southwest Ethiopia forest inventory project: a reconnaissance inventory of forest in southwest Ethiopia. Ministry of Overseas Development. Land Resources Development Centre. Project Report 31: 1-316.

EPCC. 2015. Agriculture and Food Security: Climate change impact, vulnerability, adaptation and mitigation. Ethiopian Academy of Science.

EWNHS. 1996. Important Bird Areas of Ethiopia. Ethiopian Wildlife and Natural History Society, Addis Ababa.

Friis I. 1983. Phytogeography of the tropical northeast African mountains. Bothalia 14: 525-532.

Friis I. 1992. Forests and forest trees of northeast tropical Africa - their natural habitats and distribution patterns in Ethiopia, Djibouti and Somalia. Kew Bull., Add. Ser. 15: 1-396.

Friis I., 1979. The wild populations of Coffea arabica L. and the cultivated coffee. Proceedings of the IXth Plenary Meeting of AETFAT: 63-68.

Gole, T.W. and Senbeta, F. 2006.A report on an inventory of forest resources in Mejengir zone as a basis for participatory forest management. EECMY, Illubabor Bethel Synod DSSC.

Senbeta, F. 2006. Biodiversity and ecology of Afromontane rainforests with wild *Coffea arabica* L. populations in Ethiopia. CUVILLIER VERLAG, Gottingen.

Seyoum, A. and Gole, T.W. 2011. The Value Chain Assessment of Major Non-Timber Forest Products in Majang zone, Gambella National Regional State. Pact Ethiopia, Addis Ababa.

Stauder, J. 1970. Notes onthe history of the Majangir and their relations with other ethnic groups in southwest Ethiopia. *In:* Proceedings of the third international conference on Ethiopian studies. Pp 104-115. Addis Ababa, Haile Sellassie I University.

Stauder, J. 1972. Anarchy and Ecology: Political Society among the Majangir. Southwestern Journal of Anthropology. 28: 153-168.

UNESCO 1984. Action Plan for Biosphere Reserves. *Nature and Resources* 20(4): 1-12.

UNESCO. 1996. Biosphere Reserves. The Seville Strategy and the Statutory Framework of the World Network, Paris.

Wakjira, D.T. 2007. Forest Cover Change and Socio-economic Drivers in Southwest Ethiopia. M.Sc Thesis. Technische Universtat Munchen, Germany.

White, F. 1983. The vegetation of Africa. A descriptive memoir to accompany the UNESCO/AETFAT/UNSO vegetation map of Africa. Natur. Resour. Re. 20: 1-356.