LANDSCAPE ACTION PLAN FOR SODO AND SODO GURAGIE WOREDAS, SNNP REGIONAL STATE

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EXECUTIVE SUMMARY

The government of Ethiopia has committed to a landscape approach to restoration under various international initiatives. Under its development blueprint, the climate resilient green economy strategy, Ethiopia aims by 2030 to sustainably manage 4 million hectares of forest, afforest 2 million hectares, and reforest 1 million hectares. Ethiopia is also committed to contributing to the African Forest Landscape Restoration Initiative, the Bonn Challenge, and the New York Declaration on Forests by restoring 15 million hectares of degraded and deforested land within the same time frame.

In 2017 and 2018, the Ethiopian Forest, Climate Change Commission (EFCCC) and World Resources Institute (WRI) carried out a landscape restoration potential and priority study in two Ethiopian woredas: in Sodo Woreda (Southern Nations, Nationalities, and Peoples' region) and Meket Woreda (Amhara region) using the Restoration Opportunities Assessment Methodology (ROAM) developed by IUCN and WRI. The study[1] indicated that different barriers were identified as obstacles to improve economic, social, and environmental goal and commitments. Barriers were identified that inhibited to improve the current economic, social and environmental objectives, where forest degradation and deforestation, loss of soil fertility, overgrazing, soil erosion and sedimentation of water bodies, flooding and landslide, as well as climate change impacts, all of which can be addressed to various extends by an increase in tree-based landscape restoration activities. Five main tree-based landscape restoration options based on their contributions to the Woredas' goals were identified and prioritized. These include: (i) Restoration of secondary forests (i.e., (assisted) natural regeneration ((A)NR)), (ii) agroforestry promotion (iii) woodlots/plantations development, (iv) enrichment planting in shrubland, and (v) Highland bamboo restoration.

This Landscape Restoration Action Plan (LRAP) for Sodo and Sodo Guragie Woredas is prepared to address the impacts of deforestation and forest degradation identified and prioritized by key stakeholders. The objective of the action plan is to reverse land and forest degradation and guide the planning and implementation of the identified FLR interventions in the landscape to tackle multiple social and environmental challenges, including climate change mitigation and adaption, land degradation, food insecurity and biodiversity loss.

In addition to previous studies made by EFCCC/WRI (2017) about the woredas, the methodologies used by the consulting team for the preparation of FLR action plan were conducting field level verification through transect walk and taking geo-reference points, conducting stakeholder meetings and discussions on the prevailing challenges and opportunities and then to identify different FLR intervention options. In addition, the vision of the FLR intervention, objectives of the action plan, role and responsibilities of the different actors in the restoration process were identified during the workshop.

[1] Environment, Forest, and Climate Change Commission. 2019. *Tree-Based Landscape Restoration Potential and Priority Maps for Sodo Guragie (SNNP Regional State).* Addis Ababa: EFCCC.

Based on reports from the previous studies and field level verification, potential areas for different FLR interventions had been analyzed and identified, which showed that out of the total land area of the woreda (95876 ha) the following land sizes have potential for different FLR interventions: (i) Restoration of secondary forest 29,771ha; (ii) Agroforestry promotion 46,737 ha; (iii) Woodlots development about 4,356 ha; and (iv) Reforestation/afforestation about 7,136 ha.

Taking into consideration of the identified potentials and local experiences of the stakeholders, the following action plan was proposed for the coming five years:

(1) Restoration of secondary forest through natural regeneration – 1300 ha
(2) Enrichment planting 8,350 ha
(3) Reforestation/afforestation –1595 ha;
(4) Woodlots development – 875 ha; and
(5) Agroforestry promotion to reach about 3,000 HHs and plant about 150,000 seedlings.

The following strategies and recommendations are made for successful implementation of the action plan:

- A detailed sustainable forest resources management plan preparation for different forest types and livelihood improvement interventions are very important;
- Close and sustainable technical and financial support would be very critical until the farmers start to generate income from the tree-based forest landscape restoration interventions;
- Coordination, collaboration and commitment of the stakeholders and capacity building of the local communities would be essential to ensure success of the interventions;
- Diversification of income of the local communities would be necessary to minimize pressure on the forest and tree resources.

ACRONYMS AND ABBREVIATIONS

AGP	Agricultural Growth Program
ANRS	Amhara National Regional State
WRI	Word Resource Institute
BOA	Bureau of Agriculture
SNNPR	South Nations, Nationalities People Regions
CRGES	Climate Resilient Green Economy Strategy
CSA	Central Statistical Agency
DA	Development Agent
EEFRI	Ethiopian Environment and Forest Research Institute
EPFA	Environmental Protection and Forest Authority
FAO	Food and Agriculture Organization of the United Nations
ROAM	Restoration Opportunities Assessment Methodology
FDRE	Federal Democratic Republic of Ethiopia
FLR	Forest Landscape Restoration (FLR)
GDP	Gross Domestic Product
GOE	Government of Ethiopia
GTP	Growth and Transformation Plan
ISFL	Initiative for Sustainable Forest Landscapes
IUCN	International Union for Conservation of Nature
LULC	Land Use and Land Cover
EFCCC	Environment, Forest and Climate Change Commission of Ethiopia

1 INTRODUCTION

Under the auspices of UN commitments and international multi-stakeholder initiatives, nations are increasing their efforts to reverse land and forest degradation and engage in landscape restoration to tackle multiple social and environmental challenges, including climate change mitigation and adaptation, degradation neutrality, food security and biodiversity loss. Therefore, Forest Landscape Restoration (FLR) has received international attention as a practical means for realizing many existing international commitments to restore ecosystem integrity while at the same time improving human well-being through multifunctional landscapes (Zeleke and Vidal, 2020). The Bonn Challenge is a global effort "to bring 150 million hectares of the world's deforested and degraded lands into restoration by 2020, and 350 million hectares by 2030" (IUCN, 2011) as well as regional initiatives support the Bonn Challenge such as 20x20 in Latin America and AFR100 in Africa.

Forests and trees outside of forests contribute to human well-being and ecosystem health (Zeleke and Vidal, 2020). They directly support the livelihoods of farm- and forest-dependent communities through their provision of timber and non-timber forest products, income generation and increasing agricultural productivity (e.g., nitrogen fixation in cropland, fodder for livestock, pollination). In addition, they can play crucial roles in regulating water flows, decreasing floods and landslides; supporting biodiversity; and sequestering carbon. Different tree species deliver different ecosystem goods and services based on their location, management, and spatial pattern within a landscape (EFCCC, 2020). For example, trees in settlements can provide food, shade, carbon sequestration, and beautification, while trees in cropland can contribute animal feed, high-value non-timber tree products, wood fuel, erosion control, protection from landslides, soil fertility, and carbon sequestration. Even more, trees within the same land use-land cover can be associated with different ecosystem goods and services based on their spatial pattern. Trees along farmland boundaries, and trees scattered within the field, have most likely been planted or retained for different reasons: in the first case, the farmer's main goal might be the procurement of timber or wood fuel; in the latter case, it might be to increase the productivity of his/her crops or livestock.

FLR offers demonstrated opportunities for win-win scenarios that can achieve increases in ecosystem productivity while simultaneously delivering food security, poverty alleviation, and broader socio-economic development objectives. Bringing back these benefits is especially needed and most urgent in areas where forest ecosystems have been severely disrupted or degraded. Therefore, there is a need to create enabling conditions to help realize such success factors, while at the same time efforts are needed to close gaps on factors that undermine FLR initiatives.

In late 2018, the Environment, Forest and Climate Change Commission (EFCCC) launched the country's 10-Year National Forest Sector Development Program (NFSDP) (EFCCC, 2018) targeted to serve as the main guiding document for coordinating strategic policy interventions and sector-wide investments. Its goal is to build on the country's considerable forest resources and leverage existing momentum to transform Ethiopia's forestry sector. This goal will be achieved

by attracting foreign investment, catalyzing GDP growth, generating employment, contributing towards self-sufficiency in forest products and enhancing ecosystem services. Forest landscape restoration (FLR) interventions fall under this umbrella.

Factors leading to the successful implementation of FLR initiatives are localized and context-specific. In Ethiopia, the Restoration Diagnostic for FLR implementation (WRI, 2015) was successfully carried out in 2017 & 2018 in two Ethiopia districts or woredas: in Sodo Woreda (Southern Nations, Nationalities, and Peoples' region) and Meket Woreda (Amhara region). In addition, field verification visit was made in February 2021 where stakeholders meetings and transect walk were conducted. The objective of running these diagnostics and field verification were to identify the barriers and opportunities leading to the successful implementation of FLR and design strategies that close gaps or overcome such obstacles. Therefore, this action plan is prepared based on baseline situations obtained through assessment and discussions made with stakeholders for FLR interventions to harness existing opportunities and overcome deforestation and forest degradation of the Woredas.

1.1 VISION AND OBJECTIVE OF THE ACTION PLAN

The vision is to see restored and sustainably managed landscapes across the country to boost provisions of goods and ecosystem services to humanity and all life that depend on those landscapes by restoring an optimal balance of ecological, economic and social benefits where forests and trees are an integral part.

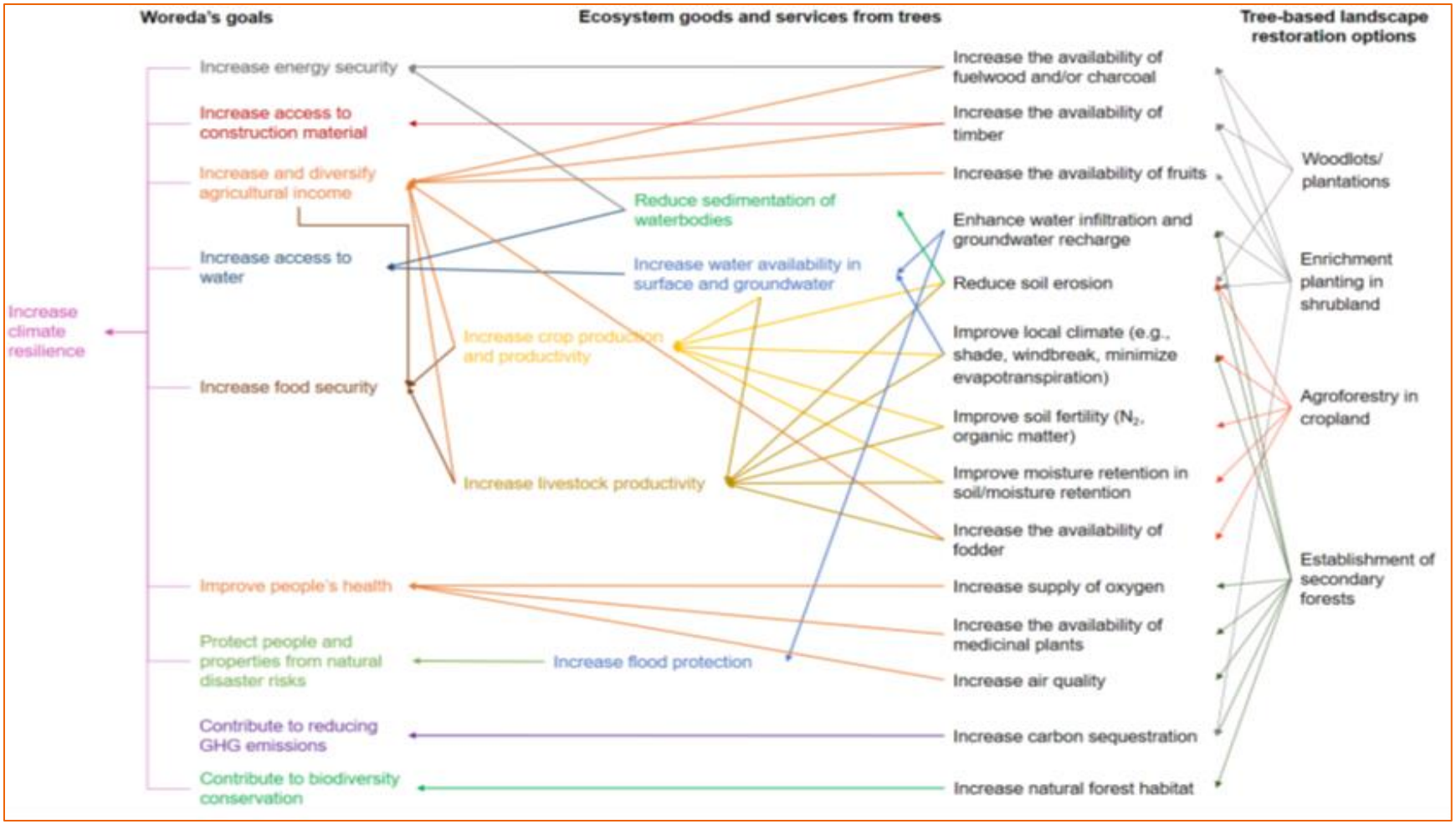
The goal of the landscape restoration action plan is to guide the journey towards the vision of those landscapes. By that we mean the landscape action plan has the following objectives:

- Establish a shared vision for landscape restoration among local stakeholders, clarify roles and responsibilities, and strengthen local ownership of FLR activities.
- Create a collaborative platform to develop joint implementation plans for identified FLR intervention, and
- Strengthen Woreda, Kebele, and landscape level platforms for FLR coordination to mainstream and accelerate implementation of FLR initiatives into sectoral plans.

The successful implementation of the identified interventions will contribute towards the Woreda goals by restoring the ecosystem services and goods presented in the chart here[2].

[2] Environment, Forest and Climate Change Commission. 2019. *Tree-Based Landscape Restoration Potential and Priority Maps for Sodo Guragie (SNNP Regional State).* Addis Ababa: EFCCC.

Figure 1 | Linking Sodo Guragie Goals, Ecosystem Goods & Services from trees, and selected tree Based Landscape Restoration Options



Source: EFCCC 2019[3]

[3] EFCCC (2019). *Environment, Forest, and Climate Change Commission. 2019. Tree-Based Landscape Restoration Potential and Priority Maps for Sodo (SNNP Regional State). Addis Ababa: EFCCC*

1.2 APPROACHES AND METHODOLOGY

The action plan builds upon multiple previous studies conducted in Sodo and some covering the entire SNNP region. Five of those main studies cover components of the Restoration Opportunities Assessment Methodology (ROAM) developed by the International Union for the Conservation of Nature (IUCN) and WRI (IUCN and WRI 2014)[4]. WRI, EFCCC and SNNP regional partners implemented those ROAM components in a phased approach and contextualizing to local conditions of Sodo Woreda. The following products were generated from these studies upon which this action plan builds:

1. Assessing tree cover and distribution for tracking progress towards targets and informing adaptive management[5]. This study evaluates the change in tree cover percent, tree cover distribution patterns, and the land cover changes of Sodo between 2010 and 2015 using Collect Earth Mapathons[6].
2. Contributing to scaling up forest landscape restoration in Ethiopia. Restoration diagnostic applied in Sodo Guragie (SNNPR) and Meket (Amhara region) Woredas[7]. This study looks at the restoration diagnostic that covers the biophysical, socio-economic, and policy enabling environment.
3. Tree-based Landscape Restoration Potential and Priority Maps for Sodo (SNNPR Regional State)[8]. This study identified list of restoration intervention types and maps and statistics for Meket.
4. Trees, Forests and Profits in Ethiopia: An Assessment of Tree-Based Landscape Restoration Investment Opportunities in Ethiopia[9]. The study evaluated the investment opportunities in forest sector of Ethiopia (timber and non-timber) with a deep dive on 8 existing companies in across different regions.
5. Potential for Tree-based Landscape Restoration (FLR) for SNNPR Regional State[10]. The FLR regional map covers the entire SNNPR. It refines and further improves the maps and statistics of the available FLR potential by catering the mapping criteria in discussion with local stakeholders in SNNPR.

Based on the different outputs being generated from the earlier study, the consulting team prepared the landscape restoration action plan for Sodo and Sodo Guragie with support from local partners, including the woreda administration, the environment and land use office, Offices for Agriculture, Water, Energy and Mining, woreda officers of various government departments,

[4] IUCN and WRI (2014). A guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing forest landscape restoration opportunities at the national or sub-national level. Working Paper (Road-test edition). Gland, Switzerland: IUCN. 125pp
[5] EFCCC 2020. Assessing tree cover and distribution for tracking progress towards targets and informing adaptive management: Sodo (SNNPR Regional State), Ethiopia. Addis Ababa: EFCCC
[6] Mapping Together using Collect Earth Mapathons
[7] Zeleke, A. and Vidal, A. (2020). Contributing to scaling up forest landscape restoration in Ethiopia. Restoration diagnostic applied in Sodo Guragie (SNNPR) and Meket (Amhara region) woredas. Gland, Switzerland: IUCN
[8] Environment, Forest, and Climate Change Commission. 2019. Tree-Based Landscape Restoration Potential and Priority Maps for Meket (Amhara Regional State). Addis Ababa: EFCCC
[9] Environment, Forest, and Climate Change Commission. 2020. Trees, Forests and Profits in Ethiopia: An Assessment of Tree-Based Landscape Restoration Investment Opportunities in Ethiopia. Addis Ababa: EFCCC
[10] Potential for Tree-based Landscape Restoration (FLR) for Amhara Regional State

such as forests, energy, livestock, attorney, cooperative, women, and youth as well as farmers, and nongovernmental organizations (NGOs) participated.

The action plan development process was focused on five principal questions:

- **Restoration potential:** Based on the existing kebeles at Sodo and Sodo Guragie Woredas, the consulting team was paid due attention in responding to: Which restoration interventions are suitable? Transect walks with key informants were conducted to verify ground situations in relation to the recommendations made in previous studies and observe FLR interventions options, including restoration of secondary forest through area ex-closure, enrichment planting and natural regeneration, reforestation/afforestation, woodlots development, agroforestry development and buffer plantation along waterbodies for the landscape. In addition, geo-references were taken in different land use system to cross-check and verify existing maps. Ensuring the existing biophysical and socioeconomic conditions being used for mapping are corresponding with the identified FLR options, such land use land cover, FLR intervention potentials options:
- **Ecosystem services analysis:** What ecosystem services and benefits can be derived from the identified restoration interventions? Validating the area estimated and mapped of respective FLR options with the concerned stakeholders from Woreda.
- **Policy, legal, and institutional analysis:** What enabling conditions are in place or missing to achieve landscape restoration?
- **Social landscape analysis:** Who are the actors that can facilitate implementing landscape restoration?
- **Cost analysis:** What is the financial cost of implementing the identified restoration interventions?

Photo courtesy of BAGER Consultant

2 BASELINE SCENARIO

2.1 BIOPHYSICAL PROFILE OF SODO AND SODO GURAGIE

Sodo and Sodo Guragie is located, within Guragie zone, in the Southern Nations, Nationalities, and Peoples' Region (SNNPR) of Ethiopia. Sodo and Sodo Guragie lie between 8˚26 5.6''76'N and 38˚36''43.56'E, bordered on the south by Meskane Woreda, and on the west, north and east by the Oromia Regional State. Sodo and Sodo Guragie are comprised of 59 kebeles (54 rural and 5 urban), and the administrative centers are the town of Buee and Kella, respectively. Infrastructure in the woreda is poorly developed; only one asphalt road crosses through the woredas, while all rural kebeles are connected through dry weather feeder roads. The urban towns of Buee, Kella, Suten and Tiya towns have access to electricity, with the remaining rural kebeles entirely depend on biomass energy (firewood and animal dung) for domestic fuel and lighting. Telephone landlines and cell phone facilities in the district are not reliable, as in most rural area there is not enough network coverage.

Agro-climatically, Sodo and Sodo Guragie are classified roughly into three agro-ecologies (i.e., KOLLA, WEYINA DEGA and DEGA) with a total land area of 93,800 ha of which KOLLA 3.4%, WEYINA DEGA (midland) 66.8%, and DEGA (high land) 29.8% (Table 1).

Table 1 | Agroecological Zones of The Woredas

Agroecology	Elevation (m)	Land area (ha)	%
Kolla	1362-1800	3158.0	3.4
Weyna Dega	1800-2400	62,630.0	66.8
Dega	2400-3606	28,012.0	29.8
TOTAL		**93,800**	**100**

Average daily temperatures in these three classifications range between 10 ^{0}C to 25 ^{0}C. Altitude in Sodo ranges from 1362-3602 m.a.s.l. Gentle slopes characterize the topography of the area, to rugged slopes in the midlands and undulating plains and hills in the highland, with flat plains (40%), slopes (30%), mountainous (7%) and rugged terrain (3%). The soils in Sodo and Sodo Guragie are mostly sandy loam (60%), black (22%) and red (12%) types. A predominantly sandy loam soil type also means escarpment in the woreda is vulnerable to soil erosion and land degradation, with corresponding reduced productivity of the land. Current land degradation is a result of extensive human activities and related biophysical factors. Annual rainfall ranges from 800–1200 mm, historically characterized by erratic nature, uneven distribution, and extreme unreliability. Sodo and Sodo Guragie have two rainy seasons: the main rainy season (KIREMT), which lasts from mid-June to mid- September and the short rainy season (BELG) from February to April. The contribution of the short rainy season to crop production has gradually diminished due to declining trends both in duration (short) and intensity (low). While the moisture from the BELG rainy season still assists farmers during the preparation of soil for farming, the lack of enough BELG rain is reportedly a challenge to FLR activities such as replanting activities in plantation sites.

Sodo and Sodo Guragie are mainly represented by two vegetation types. The highland (DEGA and Mid-land (WEYNA DEGA) are covered with the dry Afromontane forest while the lowland (KOLLA) are covered with Acacia-Commiphora woodland type. Dry Afromonate forest type occurring within an altitudinal range of between 1500-3200 (-3400) m above sea level; with average annual temperature and rainfall of 14- 25^0C and 700-1100 mm, respectively (Friis, *et. al.*, 2010). Tree canopies of this forest are characterized by the presence of *Juniperous procera, Podocarpus falcatus, Olea europaea ssp. Cuspidata,* and *Prunus africana*. This ecosystem represents a complex system of successions involving extensive grasslands rich in legumes, shrubs and small to large-sized trees to closed forest with a canopy of several strata. The areas with Afromontane woodland, wooded grassland and grassland include the woodlands and wooded grasslands of the plateau with *Acacia abyssinica* and *A. negrii.*

The grasslands occur in the areas where human activity has been largest and most intense and found at altitudes between 1500 and 3000 meters. The montane grassland in most places is derived from forest and other woody vegetation types. There exists also some edaphic grassland. The evergreen scrub vegetation occurs in the highlands of Ethiopia either as an intact scrub in association with the dry evergreen montane forest or usually as secondary growth after deforestation of the dry evergreen montane forest.

Acacia-Commiphora Woodland Ecosystem is characterized by drought resistant trees and shrubs, either deciduous or with small, evergreen leaves occurring between 900 and 1900 metres altitude. The trees and shrubs form an almost complete stratum and include species of Grar/Lafto *(Acatia Senegal, A. seyal, A. tortilis) and* Bedeno *(Balanites aegyptiaca).*

The total population of Sodo and Sodo Guragie is estimated at 206,816 inhabitants. Based on the Central Statistics Authority (CSA), Sodo is among the most densely populated woredas in the country, with 326 people per km² of land, well above the national average (127), SNNPR (141) and zone (294) averages, respectively. About 90% of the woredas inhabitants live in rural areas. Average family size in the woredas is 5 persons per household.

About 85% of the people in the candidate landscape depend on crop-livestock mixed farming systems as a primary source of their livelihoods. Agriculture is predominantly rain-fed, with small-scale irrigation by nearly 25% of farmers, who reside along the Meki river and produce vegetables mainly for local markets. Most landholdings in Sodo range from less than 2 hectares, with 53.1% of households owning 0.5-2 hectares, 25% of households own less than 0.5 hectares, and additional 7.4% of households reportedly landless.

Crop and livestock production are highly integrated as a means to generate income, insure against environmental variability and risks and meet household consumption needs. Maize, wheat, and TEFF are the major annual crops grown while ENSET is a perennial staple crop. Outputs from crops and livestock are used mainly for household consumption, with some outputs used for markets to obtain cash income. Wheat, TEFF and maize are used as the main cash crops. At the same time, the sale of eucalyptus trees, livestock trade (from animal fattening) and off-farm activities provide some additional sources of income for communities. Further, like other parts of

zone, rural-urban migration is a popular livelihood strategy in Sodo and Sodo Guragie whereby rural youth migrate to Addis Ababa and neighboring towns in search of employment. According to the Woreda Department of Early Warning and Disaster Risk, Sodo and Sodo Guragie are generally considered food secure, with periods of transient food insecurity or problems of food shortages caused by natural disasters such as frequent droughts, frost or landslides. The most recent drought was reported in 2015/16. During periods of food shortages, eight to ten kebeles could fall under the Woreda's emergency food assistance.

Photo courtesy of BAGER Consultant

2.2 LANDSCAPE CHALLENGES AND OPPORTUNITIES

The Restoration Diagnostic for Forest Landscape Restoration (FLR) was carried out in 2017 & 2018 in two Ethiopia districts or woredas: in Sodo Woreda (Southern Nations, Nationalities, and Peoples' region) and Meket Woreda (Amhara region) to identify the barriers and opportunities leading to the successful implementation of FLR and design strategies that close gaps or overcome such obstacles (Zeleke and Vidal, 2020). Thus, the study showed that the expansion of agricultural lands and overgrazing, combined with rapid population growth linked to an increased demand for biomass, recurrent droughts and chronic poverty have accelerated the overexploitation of Ethiopia's natural resources. Deforestation and degradation of forests lead to increased erosion, loss of water resources, lack of firewood and construction materials, low agricultural productivity (reduced yields and increased input requirements such as fertilizer use), reduction in live-stock production, soil nutrient depletion and degradation, and potentially desertification. Furthermore, the described impacts from degradation can lead to unemployment and outmigration, food shortages and conflicts between communities for limited resources (Zeleke and Vidal, 2020).

On the other hand, threats have been recognized long ago by the Government of Ethiopia and addressing them is critical for the country's economic growth and development. Accordingly, since the 1990s the government has prepared policies, strategies, proclamations, programs and plans to safeguard the country's forest, and directly or indirectly address the conservation and development of forest resources and landscape restoration interventions. In late 2018, the Environment, Forest and Climate Change Commission (EFCCC) launched the country's 10-Year National Forest Sector Development Program (NFSDP) (EFCCC, 2018) aimed to serve as the main guiding document for coordinating strategic policy interventions and sector-wide investments.

The need for integrating restoration activities into the broader landscape plans and into multiple sectors to tackle land degradation has got recognition as well. FLR is one of such attempts which aims to further support holistic landscape management that balances social, environmental, and economic benefits and needs.

Therefore, Stakeholders in Sodo and Sodo Guragie Woredas identified a multiple way that trees could contribute to human well-being and ecosystem health in their Woredas, including contributions to:

(i) Income through timber, crop and livestock production, non-timber forest products (NTFPs), charcoal and wood fuel;
(ii) Water security through increased water availability and reduction of sedimentation of waterbody;
(iii) Energy security through access to charcoal and wood fuel;
(iv) Physical security through protection from landslides and increased flood protection;
(v) Greenhouse gas reduction from carbon sequestration; and
(vi) Biodiversity conservation from restoration of natural forest habitat.

Figure 2 | Tree-Based Landscape Restoration Options

	Tree-Based Landscape Restoration Options							
	Restoring Secondary Forests	Restocking Degraded Natural Forests	Agroforestry	Woodlots and Home Gardens	Commer-cial Plantations	Tree-Based Buffer Zones along Rivers, Lakes, and Reservoirs	Tree-Based Urban Green Infrastructure	Roadside Trees
Habitat fragmentation/ loss of biodiversity	✖	✖		✖	✖			✖
Forest degradation	✖	✖	✖	✖	✖			
Loss of soil fertility		✖						
Overgrazing/free grazing	✖	✖	✖		✖			
Deforestation	✖	✖	✖	✖	✖			
Soil erosion	✖	✖	✖	✖	✖			✖
Siltation/ sedimentation of water bodies	✖	✖	✖	✖	✖			✖
Water scarcity[a]	✖	✖	✖	✖	✖			✖
Flooding	✖	✖	✖	✖	✖			✖
Landslides	✖	✖	✖	✖	✖			✖
Climate change impacts	✖	✖	✖	✖	✖			✖
Air pollution	✖ if close to urban area	✖ if close to urban area	✖ if close to urban area	✖ if close to urban area	✖ if close to urban area	urban area	urban area	

✖ = This restoration option is important to address this land-use challenge. X = This restoration option is secondarily important to address this land-use challenge.

Source: EFCCC (2018)

Note: [a] Whether trees can improve water availability through groundwater recharge, and the extent to which they do, depends on various factors such as rainfall intensity; soil type; tree spatial distribution; tree size, age, and species; and management practices (for example, pruning) (Ilstedt et al. 2016). *Source*: Author

Study reports by Zeleke and Vidal (2020) and consultant team (February 2021) showed that the livelihood of a majority of rural inhabitants of Sodo and Sodo Guragie Woredas depend on an integrated rain-fed crop livestock production system that generates

income, helps deal with environmental risks and meets household consumption needs. Wheat, TEFF and maize are used as the main cash crops. At the same time, the sale of eucalyptus trees, livestock trade (from animal fattening) and off-farm activities provide some additional sources of income for communities.

Photo courtesy of BAGER Consultant

2.3 LAND USE AND TREE COVER OF SODO AND SODO GURAGIE WOREDAS

The study team identified that Sodo and Sodo Guragie have a total land area of 93,800ha (Zeleke & Vidal 2020). According to the current land use-land cover map about 10% and 19% of the study area is covered with forest and shrubland, respectively. Dominant land use is cropland (68%), while about 2% was grassland. The remaining small area was classified as bare, waterbody, and settlement. On the other hand, the study conducted by Zeleke & Vidal 2020 showed that the forest cover (high forest, dense woodland, and woodlot/plantation) of Sodo Woreda was about 7.5% in 2010 and increased to 8.1% in 2015. This change was mainly attributed to a change driven by an increase in both high forest and woodlot/plantation.

Table 2 | Land Use-Land Cover of Sodo and Sodo Guragie Woredas

Land use type	2020 Area (ha)	Area (%)	2021 (ha)	Area (%)
Forest	8,300	8.8	9,432	10.0
Shrubland	8,300	8.8	17,846	19.1
Cropland	58,900	62.8	63,746	67.9
Grassland	12,500	13.4	1,712	1.82
Settlement	200	0.3	924	1.0
Waterbody	1,500	1.6	16	0.02
Bare land	4000	4.3	140	0.16
Total	93,800	100	93,800	100

Source: EFCCC (2019) and BAGER (2021)

According to Zeleke and Vidal (2020), Forest land (natural and secondary forests as well as woodlots and plantations), is found predominantly in communal areas managed through area ex-closures. There are no protected areas controlled by the government and the forest managed by government institutions is reduced to areas around public buildings (schools, churches, government offices) and roadsides. Shrublands have a canopy cover of approximately 10% or combined cover of woody perennial plants ≤10% 2m in height at maturity in situ. The Woreda office considers shrublands as having a high potential of reforestation. Grasslands include natural grasslands and pasture-lands. Most woodlots are located next to croplands and a small percentage of woodlots are located in communal lands. EFCCC (2020) report showed that the total percent tree cover in Sodo Woreda was 9.5% in 2015, with wide disparities among the kebeles of which a third of them have less than 5% tree cover across all their land uses. Thirty-five of Sodo Woreda's 58 kebeles have below-woreda-average percent tree cover. The kebeles with the highest percent tree cover are in the western part of the woreda. In 2010, the percent tree cover of Sodo was 9.9%, whereas, from 2010 to 2015, 27 kebeles saw an increase in tree cover, with eight of them gaining more than 50% of tree cover, and 30 kebeles saw a decrease in

tree cover (one kebele had no change). Of particular concern is the fact that 24 kebeles lost more than 10 percent of their tree cover.

Similar study identified plenty of opportunities to increase tree cover in Sodo, where the highest tree cover percentages are unsurprisingly found in forest classes (high forest, dense woodland, and woodlot/plantation), but forest classes are less than 10% of the woreda area. Changes in percent tree cover in woodlot/plantation reflect harvesting and production cycles and therefore do not provide much insight. On the other hand, the downward trend in percent tree cover in high forest and dense woodland is a sign of forest degradation, that affected the slight upward trends in forest area observed. While there is a significant gain in tree cover in rural compound from 6.4% to 9.1%, there is only 2.5% tree cover in cropland, both in 2010 and 2015, highlighting the vast potential for Agrisilviculture in Sodo Guragie, where almost 60% of the woreda is under cropland. Agroforestry in grassland is low but increased substantially from 3.5% to 5.4% between 2010 and 2015. Achieving GTP I percent forest cover target of 19% will require Sodo and Sodo Guragie Woreda to reverse deforestation in the 27 kebeles that are losing high forest and/or dense woodland, through afforestation/reforestation and assisted natural regeneration, and sustainably managed woodlots/plantations, and to protect the forests in the remaining 31 kebeles.

2.4 ENABLING ENVIRONMENT

The ecological conditions in Sodo are conducive to FLR. The various indigenous trees on communal lands provide the ecological capital required for natural regeneration as well as the collection of seeds, which can be raised in nurseries for the restoration of degraded forest land that no longer responds to passive restoration. Reports on natural vegetation across the different terrains (highland and mid to lowland) showed that the main vegetation types include: *Juniperus procera, Cordia africana, Olea africana, Carissa edulis (Agam), Dodonia viscosa, Acacia abyssinica, Arundinaria alpine, Acacia seyal, Acacia albida, Balanites aegyptiaca*, and *Acacia tortilis*. In the rift valley part of Sodo Woreda, acacia trees called *Faidherbia albida* are most commonly found agroforestry species within farmlands and this is an excellent opportunity to be scaled up. In addition, the Woredas also have multiple exotic species including *Eucalyptus globulus, Eucalyptus camaldulnesis, Grevillea robusta, Melia azedarach, Moringa stenopetala, Cupressus lusitanica, Acacia decurrence, Acacia saligena, Shinuse molle,* and *Sesbenia sesbane*. Farmers in Sodo and Sodo Guragie value eucalyptus as a major source of income, and eucalyptus is prominent on farmland, around homes and at road boundaries. As a result, eucalyptus species occupy more extensive land cover compared to other tree species. The altitude ranges and average annual rainfall provide an opportunity to increase the number of trees and tree yields in the landscape. However, lack of enough BELG rain in Sodo particularly can be a challenge to FLR activities such as for running replanting activities on plantation sites. The study showed that with 88% of the Sodo woreda being identified as having potential for any, or a combination, of the forest landscape restoration options (EFCCC, 2019):

In Ethiopia, forest restoration is a high priority on the government's agenda and is reflected in a number of different legislations and policies. The Federal Forest proclamation (1065/2018) sets

out provisions for local communities to participate in forest management through recognition of community forest as a third type of forest ownership. The country has very comprehensive Sustainable Land Management (SLM) policy documents which are intended to provide guidelines on land use management and administration. An effective land tenure system is broadly considered an essential precedent for ensuring successful FLR implementation, where the practice of area ex-closure is mostly undertaken to restore (Zeleke and Vidal, 2020).

Guided by national policy priorities and provisions under Federal Rural Land Administration and Land Use Proclamation (No 456/2005), SNNP Proclamation No. 110/207 guarantee access to land for agriculture for rural residents. For example, Proclamation No. 110/207 stipulates that rural youth has the right to be allocated land for agriculture by the community or government; any resident of the region who wants to engage in agriculture has the right to acquire land by settlement in conjunction with minimum landholdings of 0.5ha (rain-fed agriculture). Implementing this provision constitutes an ever-growing challenge in the face of high population growth and increasing land degradation. Improving agricultural productivity through modern technologies that increase the number of trees in the landscape is essential to minimize degradation pressures (Zeleke & Vidal, 2020).

Community participation for FLR activities is essential in all the stages from planning, decision making and implementation. It is important to expand the roles of farmers and other community members' role in the planning of FLR activities through devolution of decision-making authority. Participatory approaches exist in other areas in the country, where integrated watershed development areas follow a Local Level Participatory Planning Approach (LLPPA), where the community has a significant role planning and deciding future activities in their lands, and the expert occupy a facilitator role. This practice combines tree planting, watershed protection and physical soil and conservation measures to restoring degraded landscapes. Direct benefits and revenues from these resources (mostly pasture or access to NTFPs like honey, resins, and tree gum for instance) are distributed according to arrangements structured around community groups and guided by legally acceptable bylaws. Moreover, promoting communal plantations in the woredas could contribute to empowering communities to generate income, facilitating dialogue for knowledge exchange and capacity building whereby farmers are involved in decision-making processes for planning and implementation of FLR on shared natural resources.

Good market conditions i.e., access to markets, high product prices, and enabling environment, can have positive or negative implications for FLR. The unprecedented demand and top product price for wood and wood products is an incentive to plant trees in private and commercial woodlots, although not with a restorative or strategic land management vision. Value chains in place for sustainably produced timber and non-timber products can encourage communities to plant trees and promote the use of more sustainable practices for the landscape such as agroforestry, silvo-pastoralism or agro-silvo-pastoralism. However, the existing market drives species selection, which results in eucalyptus dominance. There is a need for the development of strategies to promote proper silvicultural and harvesting techniques, mixed plantations with alternative species and high-value tree/shrub species for effective FLR. There have been efforts undertaken with the support of NGOs to reinforce and create local value chains for agricultural products produced under restoration practices. For instance, World Vision Ethiopia has a project

focused on improving livelihoods in Sodo through local value chain development and saving approach.

The FLR options in Ethiopia is supported also by institutional enabling environments structured/ decentralized from National to Woreda/District level. The roles and responsibilities for restoration are clearly defined in their mandate in order to ensure effective implementation of FLR activities and institutional coordination is in place. The most important government agency for FLR is the Ethiopian Forest, Climate Change Commission (EFCCC), as this is the national institution responsible for environmental management and forestry development and protection. Other state institutions playing an important role in FLR include: Ministry of Agriculture (which is endowed with a comprehensive, operational and highly staffed extension system at all levels of the organizational structure, including Regional, Zonal, Woreda and Kebele).

The management and protection of forestry and forestlands fall under the responsibility of SNNPR Environmental Protection and Forest Authority (EPFA). These structures are reflected at zonal and woreda levels. The zonal and woreda structures of the EPFA were established in 2016, transferring the responsibility for forest management from the Bureau of Agriculture and Livestock Resource Management (BOANRM). It is worthy to note that the EPFA and the BOANRM have different mandates in the current regional government structure, whereby the BOANRM has regional representation and directly reports to the regional government while the EPFA does not, only reporting on the implementation of their mandate through reports that the BOANRM presents before the regional government on its behalf. Currently, BOANRM is the institution mandated by the regional government to implement the Forest Development, Conservation and Utilization Proclamation 147/2012, which was issued before EFCCC was established. The EPFA is still in the process of consolidating the newly founded administrative structures and processes. As a result, its capacity to implement and support activities on the ground is still limited.

Figure 3 | Diagnostic Analysis Results

GREEN= IN PLACE
YELLOW= PARTLY IN PLACE
RED= NOT IN PLACE

Theme	Feature	Key success factor	Response
Motivate	a. Benefits	Restoration generates economic benefits	Yes
		Restoration generates social benefits	Yes
		Restoration generates environmental benefits	Yes
	b. Awareness	Benefits of restoration are publicly communicated	Partially
		Opportunities for restoration are identified	Partially
	c. Crisis events	Crisis events are leveraged	Yes
	d. Legal requirements	Law requiring restoration exists	No
		Law requiring restoration is broadly understood and enforced	No
Enable	e. Ecological conditions	Soil, water, climate, and fire conditions are suitable for restoration	Yes
		Plants and animals that can impede restoration are absent	No
		Native seeds, seedlings, or sources populations are readily available	Yes
	f. Market conditions	Competing demands (e.g., food, fuel) for degraded forestlands are declining	Partially
		Value chains for products from restored areas exists	Partially
	g. Policy conditions	Land and natural resource tenure are secure	Partially
		Policies affecting restoration are aligned and streamlined	Partially
		Restrictions on clearing remaining natural forests exist	Partially
		Forest clearing restrictions are enforced	Partially
	h. Social conditions	Local people are empowered to make decisions about restoration	Partially
		Local people are able to benefit from restoration	Partially
	i. Institutional conditions	Roles and responsibilities for restoration are clearly defined	Partially
		Effective institutional coordination is in place	No
Implement	j. Leadership	National and/or local restoration champions exist	Yes
		Sustained political commitment exists	Yes
	k. Knowledge	Restoration "know how" relevant to candidate landscapes exist	No
		Restoration "know how" transferred via peers or extension services	Partially
	l. Technical design	Restoration design is technically grounded and climate resilient	Partially
		Restoration limits "leakage"	Partially
	m. Finance and incentives	Positive incentives and funds for restoration outweigh negative incentives	No
		Incentives and funds are readily accessible	No
	n. Feedback	Effective performance monitoring and evaluation system is in place	Partially
		Early wins are communicated	No

Source: Zeleke A. and Vidal A. (2020)[11]

[11] Zeleke, A. and Vidal, A. (2020). Contributing to scaling up forest landscape restoration in Ethiopia. Restoration diagnostic applied in Sodo Guragie (SNNPR) and Meket (Amhara region) woredas. Gland, Switzerland: IUCN.

3 THE ACTION PLAN: A BLUEPRINT TOWARDS THE ENVISIONED FUTURE

The Landscape Action Plan (LAP) development covers the two Woredas of Sodo and Sodo Guragie in SNNPR state.

The action plan is an effort to guide restoration implementation planning to reverse land and forest degradation to tackle multiple social and environmental challenges, including climate change mitigation and adaption, land degradation, food insecurity and biodiversity loss that Sodo and Sodo Guragie are facing. The plan covers five years and it is expected to be mainstreamed into the Woredas' five-year plan of Growth and Transformation (GTP III) to ensure sustainability and ownership by the government. Consider the LAP as a blueprint that sets the envisioned future of the landscape and not a project implementation plan. The latter is ideally the next step and accomplished on project by project basis. In addition, the action plan is built up on multiple previous studies in these landscapes referenced in this report. It should be evaluated in combination with those study reports.

3.1 LANDSCAPE ZONING

An attempt was made to stratify the landscapes of the study area into major agroecological and socioeconomic Zones. Maps of agroclimatic zones, vegetation atlas and livelihood zone atlas were used to achieve this zonation. The need and concept landscape zoning here is to stratify the landscape into homogeneous blocks using both biophysical and socioeconomic factors. This would help Zoning specific planning and implementation of priority interventions in respective zones to restore priority ecosystems services and targeted community needs within the respective zones. Both biophysical and socioeconomic factors were considered to stratify the landscape. Hence, the areas inside a given landscape zoning share more communality both in biophysical and socio-economic setup compared to the areas in a different zone. This way, specific priorities within each zone will come out clearer for easier decision making and implementation. Likewise, the primary beneficiaries and services to be restored will be clearer as well. This also will help with stakeholder engagement strategy, as primary responsible leads in implementation of the selected interventions within a given zoning. In a nutshell, the zones will serve as a foundation for planning and implementation.

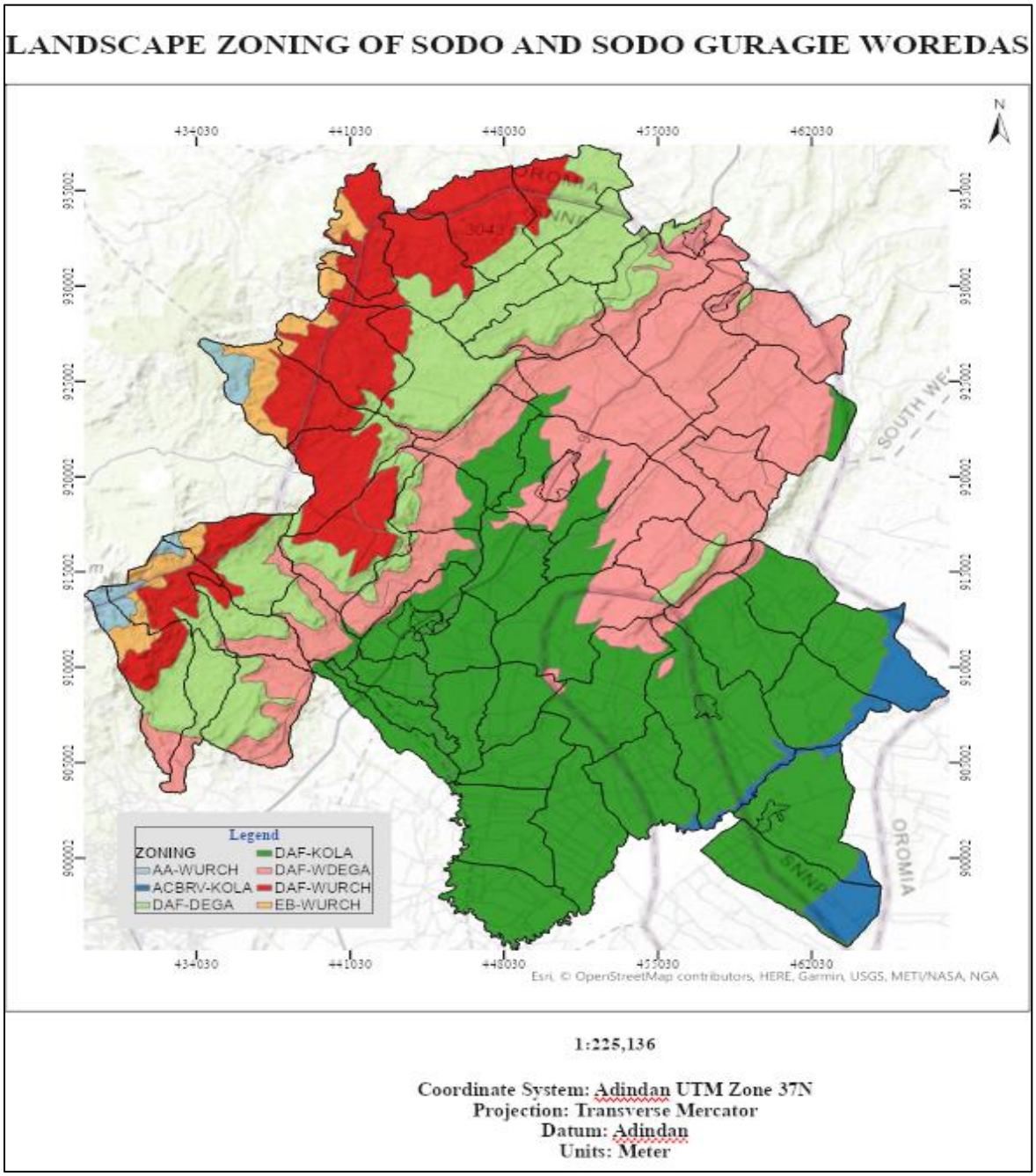
To create a more homogeneous land zoning, the map of Potential Natural Vegetation Atlas of Ethiopia (PNV)[12] and classified altitude (ELV) map were combined[13]. According to PNV atlas, there are four vegetation categories in the study area. These are the Afroalpine (AA), Ericaceae/sub-Afro-alpine belts (EB), Dry Evergreen Montane Forest and Grassland Complex (DAF), and Acacia wooded grassland of the Rift Valley (ACB/RV). Sodo and Sodo Guragie have a wide elevation diversity ranging from 1669m (KOLLA) to 3607m (WURCH). In tropical mountainous countries altitude and slope characteristics, play an important role in agroecological zonation (Friis, *et al.* 2010). Using the traditional altitude based agroclimatic

[12] Natural Potential Vegetation Atlas of Ethiopia

[13] https://www.esri.com/arcgis-blog/products/arcgis-living-atlas/imagery/high-resolution-data-updates-to-living-atlas-world-elevation-layers-and-tools-march-2021/

classification used in Ethiopia, the study area (Sodo and Sodo Guragie) was classified into four agroclimatic zones (Fig 4, Table 3).

Figure 4 | Landscape Zoning of Sodo and Sodo Guragie



These are, the Kolla (KOLA, 1500-2015m), Woyina Dega, (WDEGA, 2015-2325m), Dega (DEGA, 2325-2625m), and Wurch (WURCH, 2625-3607m). Table 3 presents the four primary landscape zoning of Sodo and Sodo Guragie based on PNV and ELV (traditional altitude). The primary (1st order) zones will be described in detail.

Table 3 | Primary (PNV-ELV)[14] Zoning

PNV-ELV ZONING	*PN LABELS*	*ELV (TRDALT) CODE*	*PNV CODE*	*ELV (upper)*	*ZONING AREA (ha)*
AA-WURCH	**(9) Afroalpine belt (AA)**	WURCH	**AA**	3607	910
ACBRV-KOLA	**(2b) Acacia wooded grassland of the Rift Valley (ACB/RV)**	KOLA	**ACBRV**	2015	2,291
DAF-DEGA	**(5) Dry evergreen Afromontane forest and grassland complex (DAF)**	DEGA	**DAF**	2625	15,031
DAF-KOLA	**(5) Dry evergreen Afromontane forest and grassland complex (DAF)**	KOLA	**DAF**	2015	35,936
DAF-WDEGA	**(5) Dry evergreen Afromontane forest and grassland complex (DAF)**	WDEGA	**DAF**	2325	25,170
DAF-WURCH	**(5) Dry evergreen Afromontane forest and grassland complex (DAF)**	WURCH	**DAF**	3607	12,304
EB-WURCH	**(8) Ericaceous belt (EB)**	WURCH	**EB**	3607	2,158
TOTAL (ha)					**93,799**

The primary landscape zones were further stratified using the Atlas of Livelihood Zones (LHZ)[15] to accommodate for socioeconomic factors. The LHZ atlas itself is built based on multiple topographic and geographic factors that affect bioclimate, population density, main agricultural

[14] "PNV-ELV" Zoning refers to primary (1st order) zoning where "PNV" is an acronym for "Potential Natural Vegetation Atlas of Ethiopia class" and "ELV" for elevation used with traditional agroecological classification of Ethiopia based on altitude-namely Kolla, Woina Dega, Dega & Wurch. ELV is a times used interchangeably with "TrdAlt" (traditional altutide classification)
[15] http://foodeconomy.com/wp-content/uploads/2016/02/Atlas-Final-Web-Version-6_14.pdf

practices, and market factors. According to this atlas, there are four LHZ zones in Sodo and Sodo Guragie Woredas. Those are the GEB, GET, GLM, SHE (Table 4). Further stratifying with the LHZ map resulted 21 sub-zones. See Table 4 for details and area distribution of each sub-zone.

Table 4 | Secondary (PNV-ELV-LHZ)[16] Zoning

PNV-ELV-LHZ ZONING	LHZ DESCRIPTION	LHZ CODE	AA-WURCH	ACBRV-KOLA	DAF-DEGA	DAF-KOLA	DAF-WDEGA	DAF-WURCH	EB-WURCH	PNV-ELV-LHZ ZONING TOTAL (ha)
AA-WURCH-GEB	Guragie-Siltie Highland Enset and Barley LZ	GEB	93							93
AA-WURCH-SHE	Soddo Highland Wheat, Barley & Enset LZ	SHE	540							540
ACBRV-KOLA-GLM	Guragie Lowland Maize and Teff LZ	GLM		2,079						2,079
ACBRV-KOLA-RVM	Rift Valley Maize & Horse Bean	RVM		89						89
DAF-DEGA-GEB	Guragie-Siltie Highland Enset and Barley LZ	GEB			11,653					11,653
DAF-DEGA-GET	Guragie-Siltie Enset and Teff LZ	GET			1,137					1,137
DAF-DEGA-GLM	Guragie Lowland Maize and Teff LZ	GLM			332					332
DAF-DEGA-SHE	Soddo Highland Wheat, Barley & Enset LZ	SHE			621					621
DAF-KOLA-GEB	Guragie-Siltie Highland Enset and Barley LZ	GEB				100				100
DAF-KOLA-GET	Guragie-Siltie Enset and Teff LZ	GET				5,511				5,511
DAF-KOLA-GLM	Guragie Lowland Maize and Teff LZ	GLM				23,262				23,262
DAF-KOLA-RVM	Rift Valley Maize & Horse Bean	RVM				5,895				5,895
DAF-WDEGA-GEB	Guragie-Siltie Highland Enset and Barley LZ	GEB					2,778			2,778
DAF-WDEGA-GET	Guragie-Siltie Enset and Teff LZ	GET					15,284			15,284
DAF-WDEGA-GLM	Guragie Lowland Maize and Teff LZ	GLM					4,590			4,590
DAF-WDEGA-RVM	Rift Valley Maize & Horse Bean	RVM					1,112			1,112
DAF-WURCH-GEB	Guragie-Siltie Highland Enset and Barley LZ	GEB						7,619		7,619

[16] LHZ is the acronym for livelihood zone derived from the Livelihood Atlas of Ethiopia, used here to further stratify the primary/1st order zoning using PNV-ELV

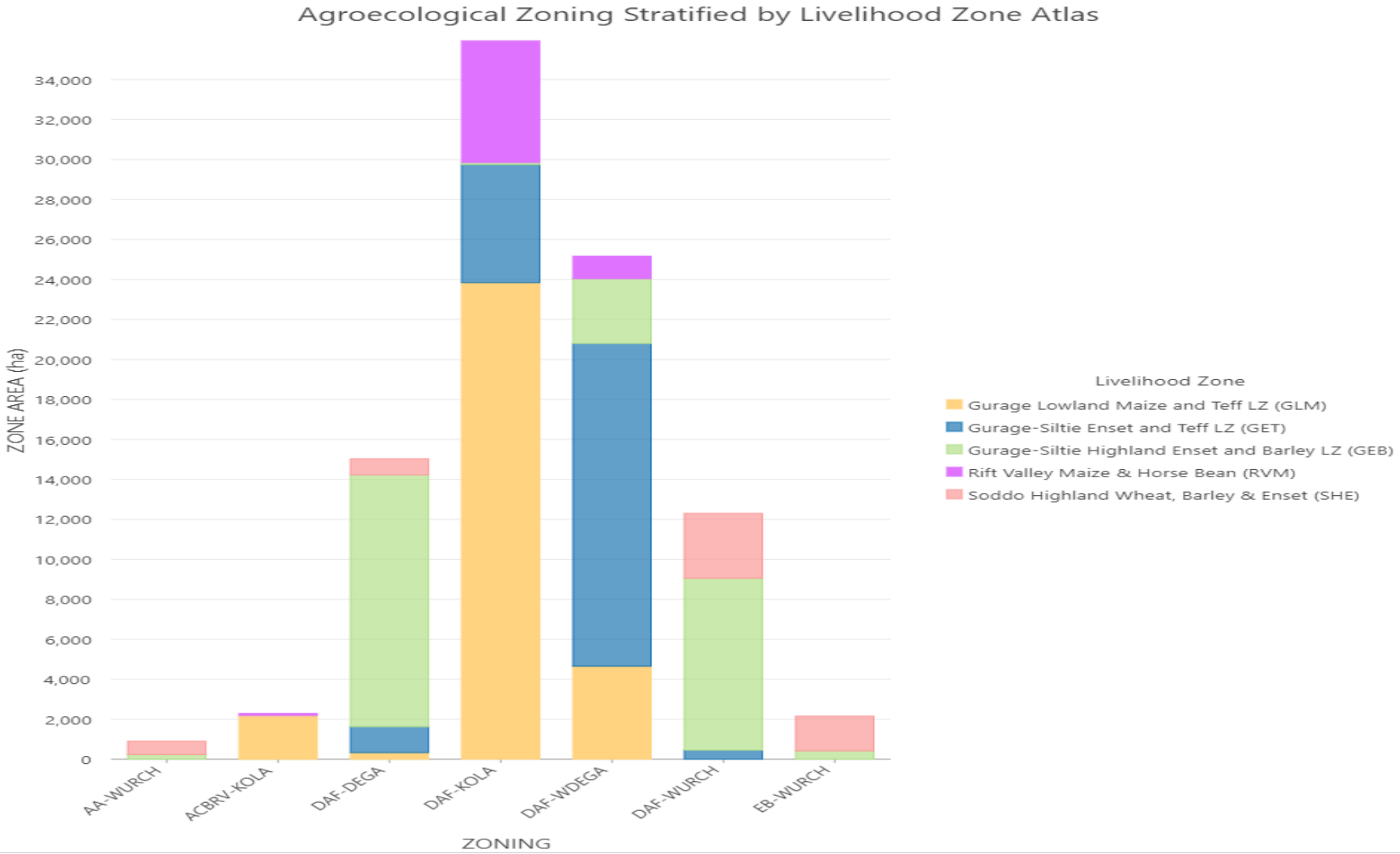
DAF-WURCH-GET	Guragie-Siltie Enset and Teff LZ	GET						392		392
DAF-WURCH-SHE	Soddo Highland Wheat, Barley & Enset LZ	SHE						3,005		3,005
EB-WURCH-GEB	Guragie-Siltie Highland Enset and Barley LZ	GEB							351	351
EB-WURCH-SHE	Soddo Highland Wheat, Barley & Enset LZ	SHE							1,554	1,554
PNV-ELV ZONING TOTAL (ha)			**633**	**2,169**	**13,741**	**34,767**	**23,765**	**11,016**	**1,906**	**87,997**

In the following sections, we discuss the 1st order zoning (PNV-ELV ZONING) only to keep the number of zones manageable. However, the 21 sub-zones should be considered during project planning and implementation. According to the zoning map, the most of the two woredas fall under the KOLLA (lowland/Rift Valley agroecology) followed by WDEGA (Mid highland) (Figure 5).

Figure 5 | Zoning Map of Sodo and Sodo Guragie Woredas

The Eastern parts of the woredas extends down to the Rift Valley (KOLLA) where acacia woodlands are dominant. Due to shortage and erratic rainfalls, it is recommended to use natural regeneration of Acacia woodland through natural regeneration in the lower limits of the study area.

Figure 6 | The Livelihood Area by Landscape Zoning for Sodo and Sodo Guragie Woredas



3.2 SUMMARY OF VERIFIED FLR POTENTIAL

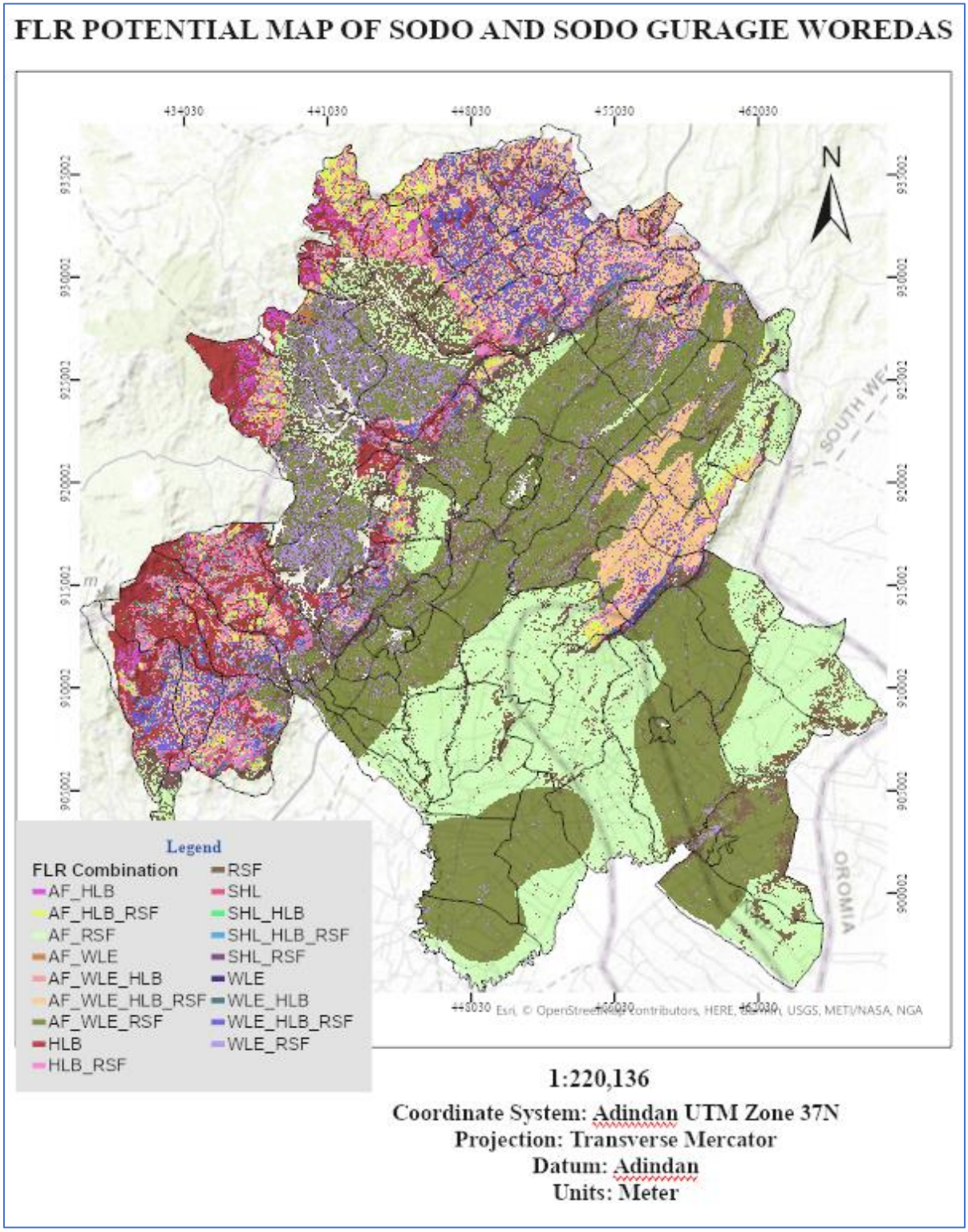
Following the national FLR mapping[1], district level study, EFCCC (2019)[17] was conducted to produce a more granular data by engaging the district experts and contextualizing the maps to the local conditions. The map on (Fig. 7) is the product of iteratively improved work building on multiple previous studies- the EFCCC (2019), EFCCC (2020), Zeleke (2020), and Dawit(2019), and further refined by BAGER consultant's field visit in (2021) input from stakeholders' workshop and focus group discussions. The engagement with districts level experts pooled from multisectoral offices helped in making informed decisions regarding at times competing landscape priorities.

The map of spatial distribution of the refined FLR and area statistics are presented on Figure 7 and Table 5 respectively. Detailed FLR breakdown by the four main landscape zoning and descriptions of each of the primary four zones are included in the Annex I.

Photo courtesy of BAGER Consultant

[17] Environment, Forest, and Climate Change Commission. 2019. *Tree-Based Landscape Restoration Potential and Priority Maps for Sodo Guragie (SNNP Regional State).* Addis Ababa: EFCCC.

Figure 7 | FLR Map of Sodo and Sodo Guragie Woredas



Box 1 | Map Legend of FLR Codes

The legend FLR codes (Box 1) comes from the two Regional (*RFLR*) and Woreda (*WFLR*) FLR maps that were combined. The combination codes are separated by "**-**" sign indicating the overlap scenario (those areas are suitable for more than one intervention).

Box 2 describes the names corresponding to the abbreviated FLR codes used with the FLR maps (even if some may not exist in this map). The corresponding colors & FLR codes separated by "=" sign in "*WFLR-RFLR EQUIVALENT*" column in box 2 mean that those FLR types are the same but originated from two maps where they were originally named differently (Box 2).

Box 2 | Legend Key and Interpretation

1 = **IMDNF** = Improved Management of Degraded Natural Forest
2 = **AfR** = Afforestation Reforestation
3 = **CPE** = Commercial Plantation
4 = **AgSLV** = Agri-silvicultural
5 = **SILVO** = Silvopastoral
6 = **WLE** = Woodlot establishment
7 = **LLBMB** = Lowland Bamboo
8 = **HLBMB** = Highland Bamboo
9 = **Myrrh** = Commiphora Woodlands
10 = **Incense** = Combretum Woodlands
11 = **RF**= Religious Forest
12 = **Riverine** = Riverine Forest
13 = **AASA** = Afro-Sub Afroalpine ecosystems

WFLR Potential	WFLR Combo Code	WFLR-RFLR EQUIVALENT
Frankincense	**FIS**	FIS = INCENSE
Secondary Forest Restocking	**RSF**	RSF = IMDNF
Agroforestry	**AF**	AF = AgSLV = SILVO
Enrichment Planting in Shrubland	**SHL**	
Woodlots	**WLE**	

Table 5 presents the summary of area statistics matrix by mapped vs verified FLR interventions. There might be cases where the mapped FLR intervention makes more sense when evaluated closely on the ground during project planning. This is so because:

1) Verification was based on limited (non-exhaustive) field visits and may not be representative of the entire study area.
2) The FLR potential is "potential" and not current reality on the ground you can observe, making observation a challenge. The observer is observing to make a judgment if the conditions for the proposed potential intervention are met rather than the interventions themselves. E.g., when visiting a site mapped as agroforestry potential area, the observers are visually assessing if all or most of the mapping criteria (EFCCC 2019)[18] used for that intervention are present or not, but not necessarily confirming that there is agroforestry in this area at the moment. Therefore, we kept the mapped potential as well so that it can be available for future scrutiny during project designing and implementation.

[18] Tree-Based Landscape Restoration Potential and Priority Maps: Sodo Guragie (SNNP Regional State), Ethiopia

Table 5 | Summary of Mapped vs Field Verified FLR Potential

SUM OF FLR AREA (HA)	REFINED FLR											
MAPPED FLR	AF_RSF	AF_RSF_WLE	AF_WLE	HLB_AF_RSF	HLB_RSF	HLB_RSF_SHL	HLB_WLE_RSF	HLB_WLE_RSF_AF	HLB_WLE_RSF_SHL	RSF_SHL	WLE_RSF_AF	Grand Total
AF_HLB						71				475		**546**
AF_HLB_RSF	520			1	1	1,248	12	457		70	3	**2,312**
AF_RSF	2,964	61	16,090	0		628	15	489		0		**20,247**
AF_WLE						8				30		**38**
AF_WLE_HLB						18				11		**29**
AF_WLE_HLB_RSF	3,724			2	14	705	515	2,220		2	41	**7,222**
AF_WLE_RSF	8,036	36	16,821		0	1,592	16	680		11	1	**27,192**
HLB	941			61		1,734	3	2,351	1,765		28	**6,882**
HLB_RSF	1,356			27		98	2	1,790	1,692		37	**5,002**
RSF	2,448	21	2,851	1		1	11	933	778		2	**7,045**
SHL						4			2			**6**
SHL_HLB						71			10			**81**
SHL_HLB_RSF	154			13		21	3	677	376		354	**1,598**
SHL_RSF	759	259		0		1	3	208	312		1	**1,542**
WLE						5			7			**12**
WLE_HLB						2			5			**7**
WLE_HLB_RSF	175			16		0	6	2,609	593		892	**4,291**
WLE_RSF	1,379	747		0		2	6	567	1,241		1	**3,944**
GRAND TOTAL	**22,456**	**1,124**	**35,762**	**122**	**15**	**6,209**	**590**	**12,982**	**6,781**	**599**	**1,359**	**87,993**

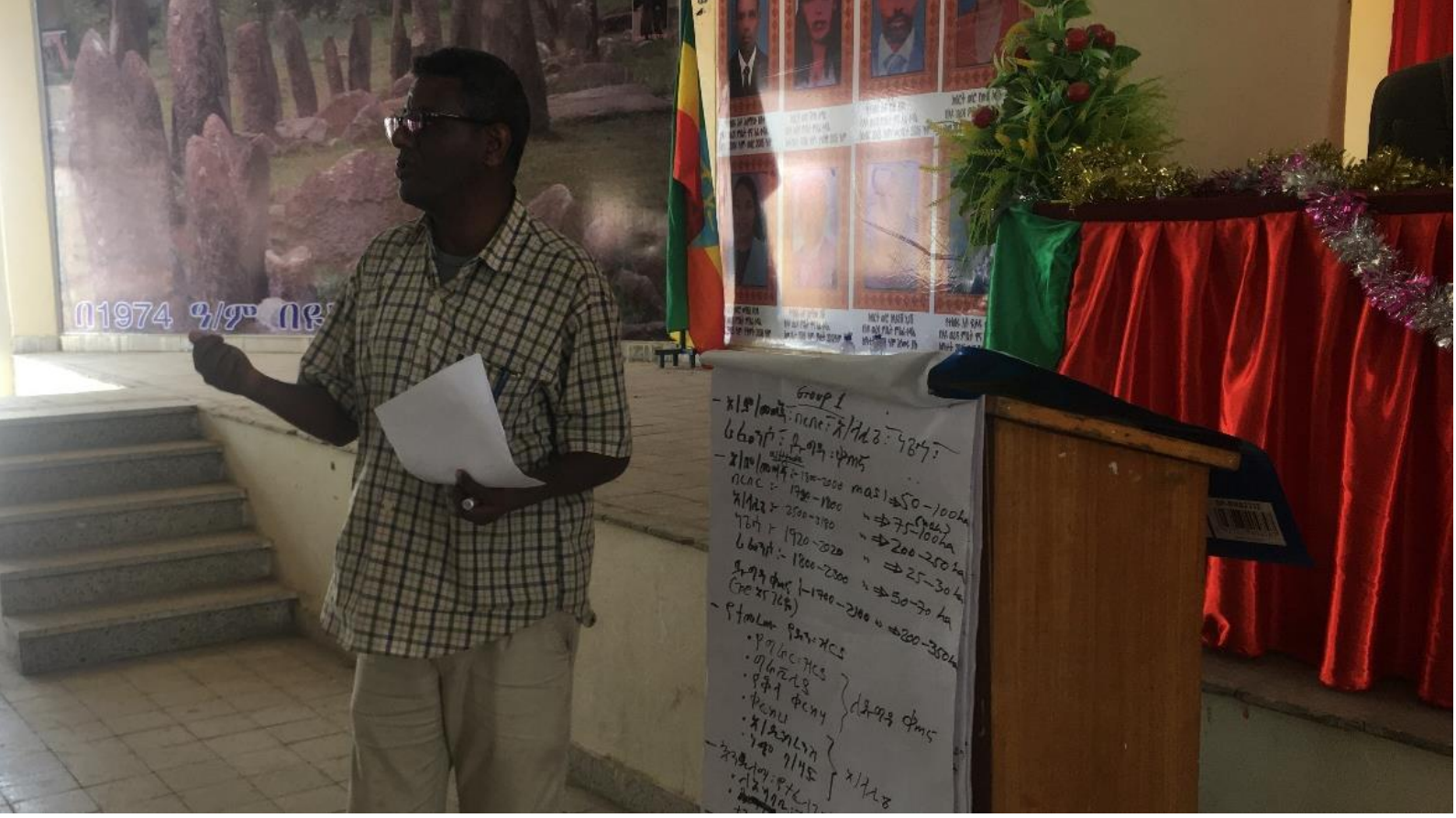

Group 1

Table 6 highlights the total mapped potential primary (1st order) landscape zoning. Please, explore the maps and tables in Annex I for further details on total potential by secondary zoning (stratified by Livelihood Atlas).

Table 6 | Total FLR Potential by Primary Landscape Zoning

ZONING	FLR	Main Native species	Area (ha)	Priority Remarks	Common FLR practices
WURCH ZONE *(AA/EB/DAF_WURCH)*	Restoration of Afroalpine/Ericaceae, Hypricum sp. And Bamboo development	Erica, Hypericum, bamboo	13,555	Management of AA/EB ecosystems on the upper limits of this zoning. Non-timber forest products including highland bamboo on AA/EB/DAF zoning.	Restoration through area ex-closure, improved management, enrichment planting & bamboo plantation development.
THE DEGA ZONE *(DAF-DEGA)*	Restoration of secondary forest (RSF), Agroforestry (AF) promotion, Woodlots development (WLE) & Highland Bamboo (HLB)	Juniperus, Hagenia, Podocarpus, Bamboo	13,744	Prioritized on DEGA and WDEGA altitude zone of primarily Dry Afromontane Forest (DAF) on degraded hilly/mountainous regions	Restoration of secondary forest, Woodlots, Agroforestry, Highland Bamboo development on DEGA sub-zone
THE WOINA DEGA ZONE *(DAF-WDEGA)*	Restoration of secondary forest (RSF), Agroforestry in cropland (AF) and Woodlots (WLE)	Many varieties, Acacia, Cordia, Ficus	23,506	Focus on areas with less than 10% tree cover for Agroforestry in croplands	Agroforestry promotion, area enclosures, improved management, enrichment
THE KOLLA ZONE *(DAF/ACBRV-KOLLA)*	Rift Valley Acacia woodland and pasture management (2,168ha) Dry Afromontane Forest in Kolla region (34,767ha)	Acacia, Erythrina, Cordia, Ficus and Acacia bushes and trees	36,935	Acacia woodland and wooded grasslands of the Rift Valley. Focus on A. albida management and development.	Rift Valley Acacia woodland management, *A. albida*/crop mixing, area enclosures and management

Table 7 describes the main services restored and hence primary woreda goals achieved by implementing the various FLR interventions in different agroecosystems and vegetation categories of the Potential Natural Vegetation Atlas.

Table 7 | Summary of the Services and Woreda Goals Targeted by the Selected FLR Interventions

SPECIFIC RESTORATION OBJECTIVES	BENEFITS	PRIMARY CONTRIBUTION TO Woredas' GOAL
Restoration of Erica and Hypericum Vegetation (WURCH)		
Management of Ericaceae	• Decreased sedimentation in catchments of hydropower infrastructure • Protection of source water • Sources of grasses for farmers	• Climate resilience • Sustainable energy • Water quality and supply • Biodiversity conservation • Erosion control
Dry evergreen forest and grassland complex and highland bamboo (DEGA & WDEGA)		
Management in deforested and degraded forests, including forest reserves, natural forests outside reserves.	• Decreased sedimentation in catchments of hydropower infrastructure • Protection of source water • Increased access to forest products for subsistence and sale, conservation of biodiversity	• Climate resilience • Sustainable energy • Water quality and supply • Biodiversity conservation • Erosion control
Woodlots Development/Reforestation/Afforestation		
Restore forest cover on degraded customary land and non-arable land in agricultural landscapes by expanding area and improving management of village forest areas and woodlots through demarcation, strengthened community by laws, and agreements for protection against uncontrolled cutting, grazing, and fire	• Locally managed, more sustainable sources of fuelwood • Increased access to forest products for subsistence and sale • Reduced burden on women in collecting fuelwood • Sources of income • Fuelwood and construction materials • Biodiversity conservation and • Soil and water conservation	• Food security • Sustainable energy • Poverty alleviation • Gender equity and equality • Firewood & Construction material supply • Water quality and supply • Climate resilience • Biodiversity conservation
Agroforestry		

SPECIFIC RESTORATION OBJECTIVES	BENEFITS	PRIMARY CONTRIBUTION TO Woredas' GOAL
Increase tree cover on degraded, low-yielding cropland and pastures in agricultural landscapes through farmer-managed and assisted natural regeneration, direct seeding, and planting of agroforestry trees and shrubs; implement climate smart agriculture techniques, including FMNR, continuous cover crops, crop rotation, other agroforestry technologies	• Increased crop yields with reduced dependence on inorganic inputs • Reduced soil/nutrient loss • Increased resilience to drought and another climate shocks	• Food security • Climate resilience
Acacia woodland of the Rift Valley and grassland woodland (KOLLA)		
Restoration and management of degraded lowland combretum-terminalia woodland	• Reduce biodiversity loss • Improve income generation from frankincense • Reduce soil and water loss	• Biodiversity conservation • Improve productivity • Water quality and quantity • Climate resilience

Source: EFCCC (2019)

3.3 FLR IMPLEMENTATION TARGETS

Through the extensive consultations, past studies and field visits to representative sites, the stakeholders identified five priority restoration interventions for Sodo and Sodo Guragie Woredas, that directly contribute towards achieving the woreda goals and help resolve the major land use and development challenges associated with deforestation and land degradation. These are:

(i) Restoration of secondary forests (RSF) (i.e., (assisted) natural regeneration ((A)NR)),
(ii) Agroforestry promotion (AF)
(iii) Woodlots/plantations (WLE)
(iv) Enrichment planting in shrubland (SHL), and
(v) Highland bamboo restoration (HLB), (NTPF)

Out of the mapped 87,997ha total potential, which is about 94% of the two woredas, the action plan development team recommended 13,359ha of the following FLR interventions to be implemented in the coming five years (by 2025). These are:

(i) 7,650ha of secondary forest restoration (RSF), of which:
    a. 6,350ha will constitute enrichment planting, while,
    b. 1,300ha will be put under (farmer managed) natural regeneration.
(ii) 1,540ha of Afforestation/Reforestation (AfR)
(iii) 2,169ha of woodlot development (WLE); and
(iv) Conduct Agroforestry promotion (AF) with 3,000households and planting of 150,000 tree seedlings.
(v) Restore/establish/develop 2000ha of Highland Bamboo (HLB)

3.4 FINANCIAL ANALYSIS OF IMPLEMENTATION

The financial analysis section is adapted primarily from Dawit W. Mulat 2019[19], Zeleke, A. and Vidal, A. (2020)[20] additional studies as referenced here.[21, 22]

Restoration Secondary Forest (RSF): Area Exclosures with/witout Enrchment Plantng/Assisted Natural regeneration

In Sodo Woreda, ex-closure is considered as main option. The total cost associated with ex-closure-based restoration is estimated to be USD$13,533.06/ha, in 50 - year time zone. From

[19] Dawit W. Mulatu (2019). Economic and Financial Analysis of Forest Restoration Opportunities in Ethiopia-Sodo and Meket Woreda.
[20] Contributing to scaling up Forest Landscape Restoration in Ethiopia
[21] Trees, Forests and Profits in Ethiopia: An Assessment of Tree-Based Landscape Restoration Investment Opportunities in Ethiopia
[22] Forest Landscape Restoration in Amhara / Ethiopia. Options for GIZ to support its implementation in the context of the Bonn Challenge 2.0

this, USD$5,733.04/ha is accounted as opportunity costs incurred as benefit lost from using the area for open access grass land which would have been used for animal fodder. From ex-closure restoration, communities can get benefits in the form of firewood, animal fodder, carbon sequestration and soil erosion protection benefits. The gross discounted benefit is estimated to be USD$34,565.32/ha, result a positive net present worth of USD$21,032.27/ha. The environmental benefits are estimated around USD$16,565.14 and USD$13,548.47/ha from soil erosion protection and carbon sequestration, respectively.

Agroforestry (AF/AgSLV)

Agroforestry is recommended as the second most important FLR option in Sodo and Sodo Guragie. The transition is from degraded agricultural land use to agroforestry. Thus, the costs and benefits associated with a transition from traditional agriculture to well-managed Agri-silviculture are estimated. Traditional crops like "Teff", wheat, barley and maize are widely practiced in the area. These crops are major crops that can be participated in agroforestry with Cordia Africana, which is recommended by local agricultural experts. The net present value of costs for this practice is estimated to be USD$13,766.99/ha. The discounted opportunity cost, USD$4,613.03/ha is the significant part of the cost which is a lost benefit from degraded agriculture. The diversity of benefits from agroforestry includes crop production, timber production, hay (as fodder for livestock), firewood; carbon sequestration and soil erosion protection are included. The net present values of gross benefits for agroforestry estimated about USD$31,638.92 that gave a net worth of USD$17,870.44/ha net benefit from this restoration option (on average benefit about USD$893.60/ha/year).

Commercial Forest Plantations (CPE)

Thirdly, landscape restoration of forest plantation was recommended. The total net present value of costs for forest plantation in 50 years lifecycle is USD$82,449.76/ha. And the net present value of total benefits including timber, firewood, fodder, carbon sequestration and soil erosion protection is USD$135,866.81 which gave a total net benefit worth of USD$53,417.05 (on average benefit about USD$1,068.34/ha/year).

Woodlots (WLE)

Fourth, woodlots are growing in the Woreda and the woodland use is expected to be growing in the future in relation to current land uses. Eucalyptus is widely planted woodlot in the area, with a total net present value of costs at USD$18,016.14/ha for 50 years. The gross net benefit present values providing woodlots, firewood, carbon sequestration and soil erosion protection benefit is estimated to be USD$82,038.21/ha. This gave a net present value with relatively higher positive return of USD$64,022.07 (on average benefit about USD$1,280.44/ha/year).

Home Gardens (WLE-HG)

Fifth, two types of home garden practices were considered that were recommended by expert and stakeholders in the Woreda. These are "ENSET" (false banana) with Cordia Africana, and Coffee with Cordia Africana which are also considered as agroforestry practices. For "ENSET" (false banana) with coffee plantation, the total net value of costs needed for restoration is estimated at USD$33,688.38. The diversity of benefits in this agroforestry practice is multifaceted for "ENSET" (false banana) that provides multiple of benefits, locally named local food "Kocho"

and “Bulla”; the leaf as a cover for baking bread “Koba” ; local made ropes “Kacha”, and “Hareg”. These are locally marketable and valuable products. The sum of net present value of the benefits both from coffee and “ENSET” (false banana) is USD$68,345.32/ha. Deducting the net present value of costs from the present value of gross benefits gave a net worth of USD$34,656.94/ha (on average benefit about USD$1,732.85/ha per year). Alternatively, the other home garden based agroforestry practice; Coffee with Cordia Africana incurs USD$11,666.33 net present value of costs and returns USD$27,596.87/ha net present value of gross benefits, resulted to earn a net worth of USD$15,930.54/ha in a 20 year period (on average benefit about USD$796.53 /ha/year).

Highland Bamboo (HLB)

Finally, highland bamboo as NTFP was considered. The total estimated value of costs in the 50 years period to be incurred in the restoration process is USD$14,092.41/ha. The benefits include bamboo products, fodder, carbon sequestration, and soil erosion protection and estimated at USD$53,877.67/ha, with net present return value of about USD$39,785.26/ha from bamboo plantation (on average benefit about USD$795.71/ha/year). See summary results in tables 8 & 9.

Table 8 | Discounted Costs and Benefits of Potential FLR Options in Sodo Woreda, SNNP Region

TYPES OF COSTS AND BENEFITS	ONLY EX-CLOSURE (USD$)	AGROFORESTRY (CROP + CORDIA AFRICANA) (USD$)	FOREST PLANTATION (USD$)	WOODLOTS (USD$)	HOME GARDEN (COFFEE WITH "ENSET" FALSE BANANA (USD$)	HOME GARDEN (COFFEE WITH CORDIA AFRICANA) (USD$)	BAMBOO PLANTATION (USD$)
IMPLEMENTATION COST	5,768.51	2,265.91	27,447.37	9,832.25	5,590.96	4,693.51	3,646.16
TRANSACTION COST	326.43	252.65	170.98	170.98	306.49	306.49	160.89
TRANSPORTATION COST	908.12	576.18	13,900.85	1,151.34	771.41	194.46	1,389.78
HARVESTING COST	796.96	1,456.89	34,172.91	1,255.27	11,939.64	1,858.84	738.76
OPPORTUNITY COST	5,733.04	4,613.03	6,757.65	6,757.65	4,613.03	4,613.03	6,757.65
TOTAL COST	**13,533.06**	**13,766.99**	**82,449.76**	**18,016.14**	**33,688.38**	**11,666.33**	**14,092.41**
REVENUES							
BENEFITS FROM PLANTATION	-	2,883.66	-	54,492.71	-	-	-
FIREWOOD	4,865.16	13.88	-	5,196.48	-	16.07	-
NON-TIMBER (BAMBOO FOR BAMBOO PLANTATION & ENSET PRODUCTS FOR ENSET WITH COFFEE)					45,993.85	-	29,369.11
BENEFITS FROM CROP (INCLUDING COFFEE)		18,721.00			17,997.61	17,997.61	
SOIL EROSION CONTROL	16,564.70	3,479.30	16,564.71	16,564.70	2,139.77	2,139.77	16,564.70
CARBON SEQUESTRATION	2,710.12	1,322.13	2,710.12	2,710.12	2,214.10	2,562.03	3,902.78

TYPES OF COSTS AND BENEFITS	ONLY EX-CLOSURE (USD$)	AGROFORESTRY (CROP + CORDIA AFRICANA) (USD$)	FOREST PLANTATION (USD$)	WOODLOTS (USD$)	HOME GARDEN (COFFEE WITH "ENSET" FALSE BANANA (USD$)	HOME GARDEN (COFFEE WITH CORDIA AFRICANA) (USD$)	BAMBOO PLANTATION (USD$)
BENEFITS FROM HAY, FODDER, AND GRASS	10,425.34	5,218.95	4,041.08	4,041.08	-	4,041.08	-
TOTAL BENEFITS	34,565.32	31,638.92	135,866.81	82,038.21	68,345.32	27,596.87	53,877.67
NET BENEFIT PRESENT VALUE	21,032.27	17,871.92	53,417.05	64,022.07	34,656.94	15,930.54	39,785.26
Lifecycle (in years)	50	20	50	50	20	20	50

Source: Adopted from (Dawit W. Mulatu, 2019)

Table 9 | Key Performance Indicators for Sodo and Sodo Guragie Woredas

Cost/benefit indicators	Area ex-closure (USD)	Afforestation/ Reforestation (USD)	Woodlots (USD)	Agroforestry (USD)	Bamboo development (USD)
Discounted cost per ha	13,533.06	82,449.76	18,016.14	13,766.99	14,092.41
Discounted benefit per ha	34,565.32	135,866.81	82,038.21	31,638.92	53,877.67
Assumed potential size of one business case in ha	82,100.00	34,900.00	7,900.00	57,800.00	21,900.00
Total discounted cost for on business case	1,111,064,226.00	2,877,496,624.00	142,327,506.00	795,732,022.00	308,623,779.00
Total discounted benefit for on business case	2,837,812,772.00	4,741,751,669.00	648,101,859.00	1,828,729,576.00	1,179,920,973.00
NPV (at discount rate 5%)	1,726,748,546.00	1,864,255,045.00	505,774,353.00	1,032,997,554.00	871,297,194.00
NPV (at discount rate 10%)	967,232,939.91	772,612,066.33	265,817,800.27	719,796,114.04	481,571,100.80

- *All figures were discounted at 5%, except the last row (10%), for fifty years rotation period. Exchange rate: USD$1 is equivalent to ETB 41.37 (April 22,2021)*

3.5 STAKEHOLDER ENGAGEMENT

3.5.1 BUILDING BLOCKS

A landscape preparation for Sodo and Sodo Guragie Woredas followed an iterative process of multi-stakeholder engagement from a very early stage to ensure the previously identified FLR options of the woredas are in line with national and sub-national priorities and local circumstances. The landscape action plan preparation was commenced through a kick off meeting with head and team leader of the EFCCC at national level, and with Zonal Head of the Guraghie Environment, Forest and Wildlife Protection and Development Office. At woreda level, discussions were conducted with the Woreda administration, Office of Agriculture and the land Administration and Use is represented the EFCC.

A stakeholder meeting was organized and held for Sodo and South Woredas and participants of the workshop were drawn from key stakeholders, government office, NGOs and the community. The team of consultants presented the findings of the diagnostic studies conducted (WRI:2017), coupled with the driver of deforestation, FLR options and potential for restoration. Based on the brainstorming session, stakeholders suggested the following landscape restoration options based on their contributions to the woreda's goals:

- ✓ Natural forest regeneration using various tree species planting such as Kosso, Tsid, Bamboo and Zigba
- ✓ Enrichment planting
- ✓ Reforestation/ Afforestation with a planting of a tree species such as Tsid, Zigba, Kerkeha, Kosso, and Woira
- ✓ Reforestation/ Afforestation with a planting of a tree species such as Tsid *(Juniperus procera, Zigba (Podocarpus falcatus), Kerkeha (Arundinaria alpine), Kosso (Hagenia abyssinica),* and *Woira (Olea europea sb.species cuspidata)*
- ✓ Woodlot's development
- ✓ Agroforestry

The meeting was shared a vision for the proposed FLR options for landscape restoration actions plans for Sodo and Sodo Guragie Woredas, with the aim to contribute to human well-being and ecosystem health in their Woreda, particularly to:

- Increase income through timber, crop and livestock production, non-timber forest products (NTFPs), charcoal, and wood fuel;
- Ensure Food security through agriculture production and NTFPs;
- Ensure water security through increased water availability and reduction of sedimentation of waterbody;
- Ensure energy security through access to charcoal and wood fuel;
- Ensure physical security through protection from landslides and increased flood protection;
- Reduce greenhouse gas emission from carbon sequestration; and
- Conserve biodiversity from restoration of natural forest habitat.

The resource requirements for landscape plan implementation have been worked out by the group, along with suggesting an enabling environment for FLR activities in the woredas. Each of the stakeholders participated in the meeting defined the role and responsibilities of the different institutions and agreed to aligning their annual planning with the developed restoration actions plans of the two woredas.

3.5.2 ROLES AND RESPONSIBILITY OF STAKEHOLDERS

The different stakeholders participated in the workshop were agreed to discharge the role and responsibilities entrusted to them mandated by law. Table 10 shows the role and responsibilities of the stakeholders to be involved in the implementation of FLR activities.

Table 10 | Roles of Stakeholders

ACTOR/INSTITUTIONS/ STAKEHOLDER	CURRENT SITUATION	DESIRED SITUATION CHANGES REQUIRED
WOREDA ADMINISTRATION (WA) **TWO WOREDA ADMINISTRATION OFFICES ARE ESTABLISHED AND OPERATIONAL AT SODO AND SOUTH WOREDAS**	Coordinate and supervise the implementation of the social services and economic development program of the woredas. Ensure the implementation of the polices, legislation and directives of the national and the regional government.	• Establish a steering committee to be drawn from key stakeholders to oversee the planning and progress implementation of the landscape restoration actions • Resource mobilization for action plan implementation
SNNPR STATE ENVIRONMENT, FOREST AND WILDLIFE PROTECTION AND DEVELOPMENT AUTHORITY	Conservation of natural resources such as forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. It is guided by the principle of sustainable development and enhancement of human wellbeing.	• Co-coordinating FLR initiatives with Bureau of Agriculture (SNNPR) in order to minimize duplication of efforts and resource wastage • Issues of new regulations to mainstream the double responsibility on natural resource conservation (mainly forests) • Coordinating identification and co-funding with other potential donors on FLR options

ACTOR/INSTITUTIONS/ STAKEHOLDER	CURRENT SITUATION	DESIRED SITUATION CHANGES REQUIRED
ENVIRONMENTAL PROTECTION, LAND ADMINISTRATION AND USE OFFICE AT WOREDA LEVEL	Preserving and enhancing the productive capabilities of land in cropped and grazed areas Actions to stop and reverse degradation - or at least to mitigate the adverse effects of earlier misuse	• Coordinate and follow up the implementation of conservation of natural resources activities, especially initiative related to FLR option; • Facilitate the engagement of Other's actors in FLR planning and implementation
WOREDA OFFICE OF AGRICULTURE & LIVESTOCK RESOURCES	Lead community mass mobilization to raise awareness on watershed development and protection (Soil erosion protection, reforestation, sustainable grazing practice, nursery management)	• Technical assistance to the implementation of FLR options being proposed for implementation • Mobilize community for ensuring their participation in landscape development and pasture development • Jointly manage nursery site for Tree seedlings
WATER, ENERGY MINING OFFICE	• Responsibility of the woreda's water sectors, energy, and the water flow and quality from different sources	• Part of the technical committee in planning and implementation of the woreda's land restoration action
OFFICE OF FINANCE AND ECONOMIC DEVELOPMENT	• Coordinate the overall social, economic development activities of the woreda by ensuring all supports, mainly in budgeting and resource mobilization from NGO's through program proposal	• Technical support for fund mobilization by guiding and ensuring the alignment of the NGOs program and resources with the overall Woreda's goal and objectives
WOREDA'S ATTORNEY	• Follow and ensure the rule of law respected and applied in the Woredas • Technical support to enforce laws	• Support in promotion and enforcement of laws relevant to Forest sector's development and protection
COOPERATIVE DEVELOPMENT OFFICE	• Organize cooperative organization to be engaged in agriculture activities, mainly in forest sector development	• Support, facilitate and ensure the issuance of by law for the group/cooperatives to be established in Forest sector development
WOODWORK PRIVATE ENTERPRISE	• Mostly run by a youth entrepreneur interested in using wood from indigenous trees but these raw materials are scarce. Allows of eucalyptus timber production, the quality of logs is improved for carpentry	• Ensure networking with existing SNNPR Forest Enterprise for market expansion

ACTOR/INSTITUTIONS/ STAKEHOLDER	CURRENT SITUATION	DESIRED SITUATION CHANGES REQUIRED
OFFICE OF TRADE AND INDUSTRY	• Licensing and renewal licenses for production and trade of marketable FLR products and Linking enterprises to market	• Support in the provision of license for forest product business in the woreda
OFFICE OF SMALL AND MEDIUM ENTERPRISES	• Register and organize the unemployed youth to engage in forest business; avail supports required for their involvement	• Facilitate the provision of land, training and finance to youth organized for forest product business in the woreda
COMMUNITIES AND FARMERS WITH WOODLOTS	• Involved in the production of fuelwood, timber, wood carvings and forest-based foods. • They combine vegetables, crops, fruits, fodder, trees and cash crops.	• Technical support to ensure their participation in development and protection and the required benefits to be shared with the communities
KNOWLEDGE INSTITUTIONS	• Welkite, University, Hawasa University, Bonga University, Mizan Teppi University and agricultural research, Forest sector Institutions are the key knowledge institution carrying out research and study on Forest sector	• Involvement of more knowledge institutions including the local and international universities and research institutes
NGOS AND DEVELOPMENT PROJECT RELATED TO SUSTAINABLE LAND MANAGEMENT AND NATURAL RESOURCE MANAGEMENT	• Promote energy efficiency & renewable energy at all levels (especially the efficient use of biomass resources at the households) • Enhance the capacity of the different development partners. • Apply sustainable land management measures in combination with income-generating activities	• Be member of the Woreda committee to align their development program with the woreda's landscape action plan and resource requirements. • Ensure positive publicity and support from local and international NGOs • Co-funding mechanisms in the implementation of the action plan

4 MONITORING OF PROGRESS

4.1 MONITORING FRAMEWORK

Monitoring is an integral part of project implementation. The reasons for monitoring are for documenting, reporting, learning, adapting, and communicating. Specifically, monitoring is needed to gauge short- and long-term success; to determine if, and when further intervention is needed; and to identify unintended consequences that threaten the sustainability of the restoration project.

The FLR interventions in Sodo and Sodo Guragie Woredas aim to restore multiple ecological, social and economic functions across landscape zones and generate a range of ecosystem goods and services that benefit multiple stakeholder groups. According to the assessment made by EFCCC/WRI:2020[23], the tree-based landscape action plan seeks to enhance the resilience of the landscape and its stakeholders over the medium (5 years) and long term (20 years). Trees in- and outside of forests contribute to human well-being and ecosystem health in many ways. People would get to know more about landscape restoration activities and be aware of the benefit they can secure from restoration of their landscapes. Trees directly support the livelihoods of farm- and forest-dependent communities through their provision of timber and non-timber forest products. Trees can also indirectly contribute to income generation by increasing agricultural productivity (e.g., nitrogen fixation in cropland, fodder for livestock, pollination). In addition, they can play crucial roles in regulating water flows, decreasing floods and landslides; supporting biodiversity; and sequestering carbon.

Based on the Millennium Ecosystem Assessment (MA, 2003) and experts' input, a monitoring framework for tree-based landscape restoration was developed (Figure 8). As indicated in the monitoring framework, the monitoring activities for tree-based intervention should go beyond the biophysical aspects and include both the changes/improvements in institutional arrangement and capacity, management, policies and regulations, and enforcement as drivers of implementation progress. Indicators measure progress on four different issues, in a similar context as described in the report for Central Truong Son landscape, Vietnam[24] focused on:

- Forest condition and biodiversity
- Forest ecosystem services
- Livelihoods
- Capacity for good management of natural resources
- Threats

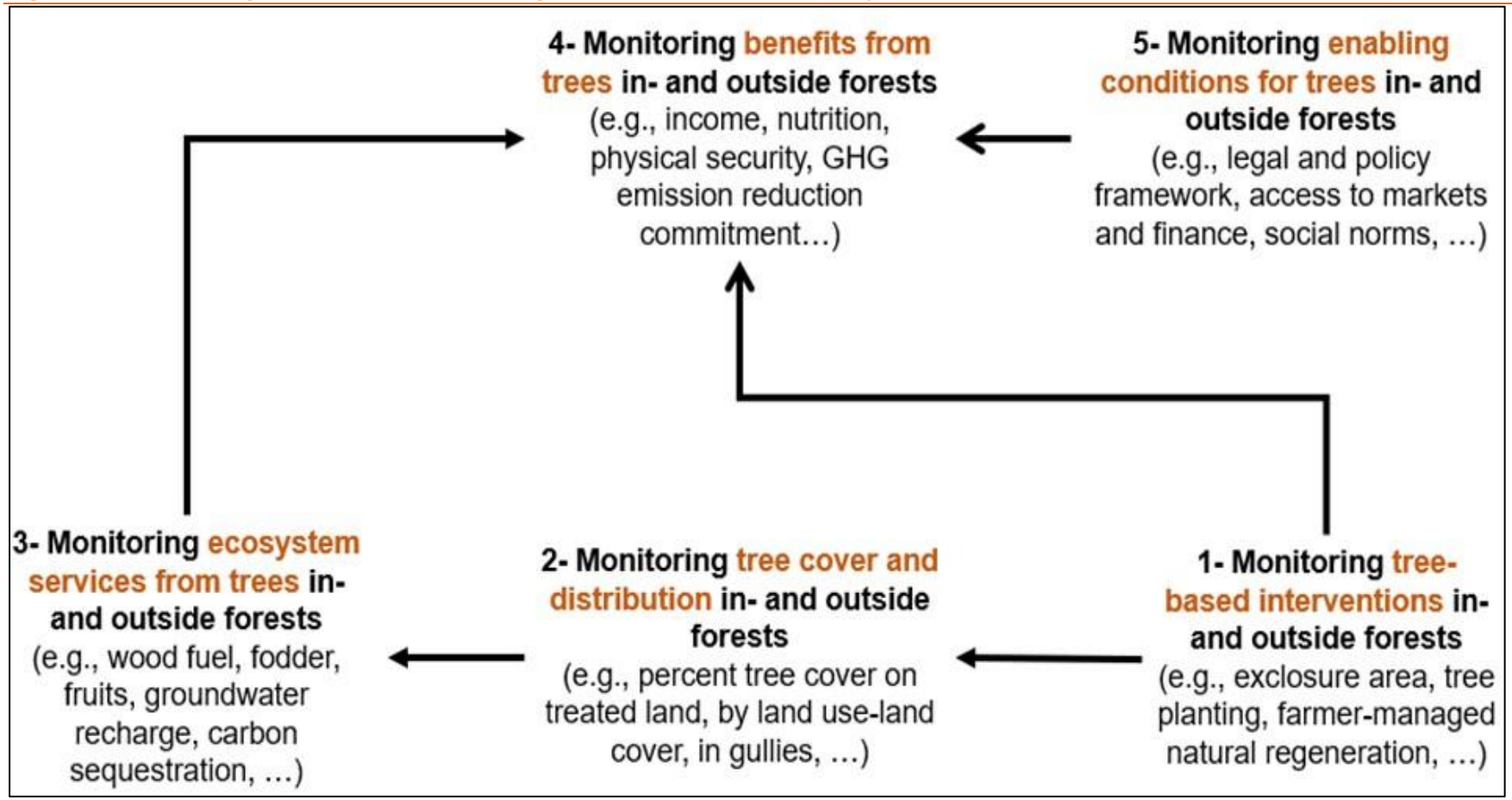
A monitorable indices should align in such a way to ease impact of tree-based intervention in medium and long time. The monitorable indices depicted in the framework encompass five areas regarding the followings:

- **Component 1:** Monitoring tree-based intervention in and outside forest. These include to monitor the enclosure areas, tree planting, farmer managed natural regeneration.

[23] Environment, Forest and Climate Change Commission. 2020. *Assessing tree cover and distribution for tracking progress towards targets and informing adaptive management: Sodo (SNNP Regional State), Ethiopia.* Addis Ababa: EFCCC.
[24] http://www.equilibriumresearch.com/upload/document/Vietnam_M&E.pdf

- **Component 2**: Monitoring of a tree-based intervention in and outside forest needs to be seen in terms of the number of trees planted, tree coverage on different FLR options, by land use cover.
- **Component 3**: Their contributions to the economic, social, and environmental objectives of restoration
- **Component 4**: Monitoring benefits from trees in and outside forest (income, nutrition, physical securing, GHG emission reduction commitment).
- **Component 5**: The extent to which conditions necessary to ensure the long-term contribution of trees and forests to human well-being and the health of the overall ecosystem are in place Monitoring enabling condition for trees in and outside forests (e.g., legal and policy framework, access to markets and finance, social norms).

Figure 8 | Monitoring FLR Implementation Progress Socioeconomic & Biophysical



Source: EFCCC (2020)[25]

[25] Environment, Forest, and Climate Change Commission. 2020. Assessing tree cover and distribution for tracking progress towards targets and informing adaptive management: Meket (Amhara Regional State), Ethiopia. Addis Ababa: EFCCC

4.2 RESULTS CHAIN

A landscape action plan for Sodo and Sodo Guragie Woredas demands to ensure results from intervention in terms of key outcomes over the plan intervention in medium (5 years) and long term (20 years). At an aggregated global level, the progress made in the landscapes is measured against the same 4 returns outcome levels: Inspirational, Social Capital, Natural Capital and Financial Capital. All stakeholders to be involved in the implementation shape their work and geared towards delivering on the four returns in long-term period.

The four outcomes of the action plan zonation:

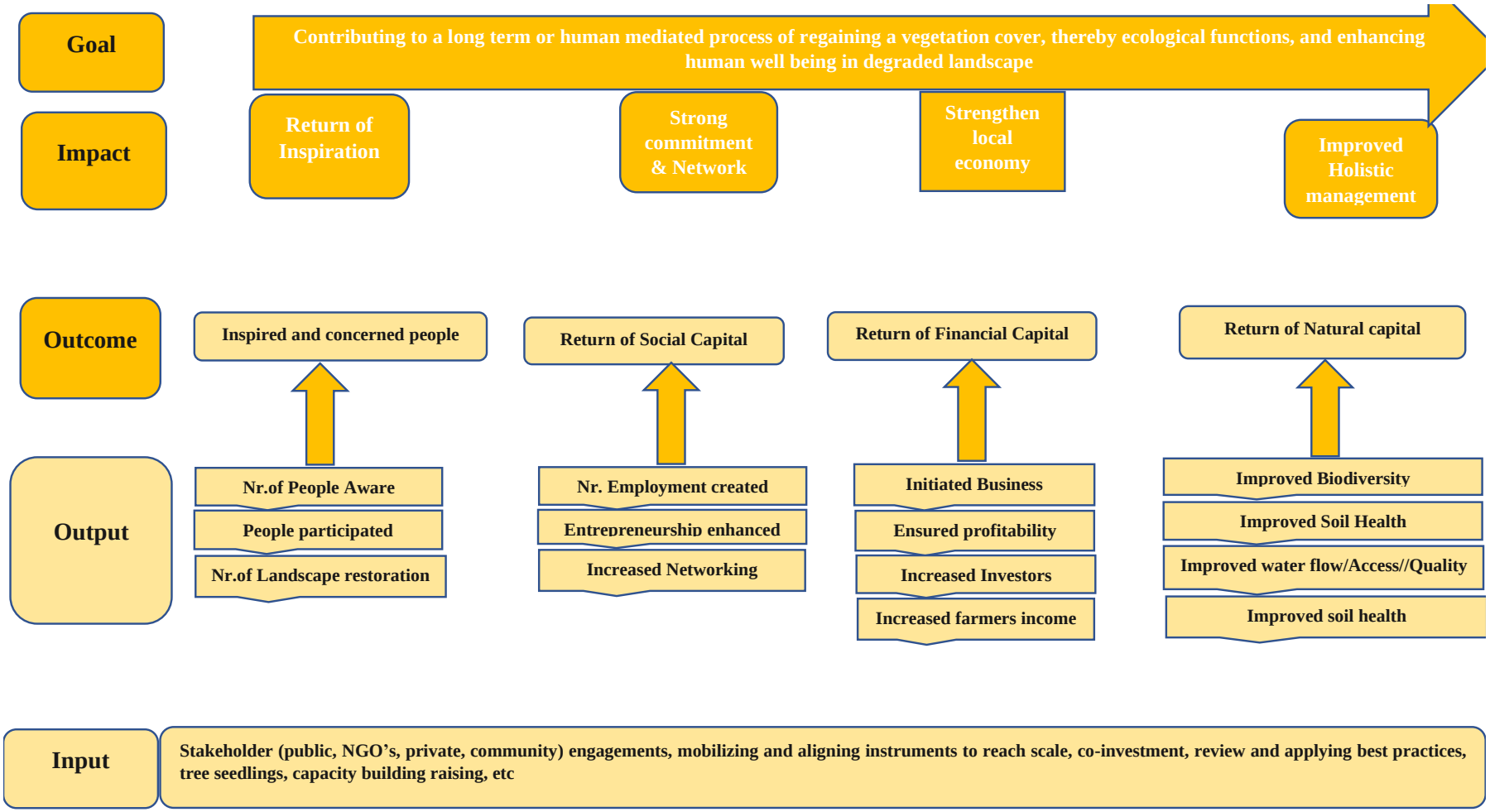
1. **Inspired and concerned People:** The actors need to be aware about the opportunity and the ecosystem services to be secured from trees in and outside forests, prominently wood fuel, fodder, fruits, ground water, etc. People need to be inspired by the benefits of tree-based landscape planning and implementing.

2. **Return of Social Capital:** Once the stakeholders are aware about the range of goods and services that the landscapes should provide, several different groups would be connected to convey important resources (knowledge/skill, finance, seedlings, market, etc.) and support for innovation through which the social capital would be enhanced through partnership and networking in the entire landscape. These would create and improve business and employment opportunities.

3. **Return of Natural Capital**: Tree based intervention in, and outside forests would ensure to improve forest quality covering natural regeneration, protected area effectiveness /status of the existing biodiversity, soil health, and improvement of water flow.

4. **Return of Financial Capital**: The financial returns of the tree-based restoration activities would ensure the possibilities and investment potential for the different forest product from their investment. Individual farmers, and private investors would gain a financial return from their investment on tree-based intervention.

Figure 9 | Results Chain



4.3 INDICATORS

The four outcomes of a tree-based intervention are categorized according to the ecosystem goods and services to be generated from intervention. Table 11 shows the proposed core indicators for each outcome, the domain to be managed and proposed indicators for each domain and timing for measurement. Core indicators will be augmented by additional information culled from research reports and field surveys. Benchmarks are also suggested for each of the core indicators, to provide a target to assess against: in some cases, these require further discussion by the EFCCC and WRI intermittently.

Table 11 | Outcomes and Indicators for Tree Based Intervention for Landscape Restoration

NR.	OUTCOMES	OUTCOME JUSTIFICATION	OUTCOME DOMAIN	INDICATOR EXAMPLES	TOOLS TO BE APPLIED FOR PROGRESS MONITORING AND IMPACT	TIMING
1	Return of Inspiration	Inspired & Connected people: Combined number of people aware of the opportunity of landscape restoration, participated in the 4 returns approach, and start 4 returns initiatives	Awareness	• # of people demonstrating positive attitudes and beliefs towards landscape restoration and its practices • # of people exposed through on- and offline interactions	• Report on people participated in the awareness creation program • KAP survey	• Every 2-5 years
			Participation	• # of people participating in landscape restoration initiatives and/or in 4 returns restorative businesses • # of people engaged in different FLR activities	• Activity report	• Annually
			Replication	• # of landscape restoration initiatives conducted • # enterprises being established inside or outside the respective target landscapes	• Social mapping for both Enabling impact and Impact monitoring	• Every 5 years

				• # of new businesses, initiatives, or projects created/ piloted		
			Most Significant Change stories*	• MSC Stories show that by Return of Inspiration people have a deeper connection to their landscape		
2	Return of Social Capital	Outcome indicator Strong communities & Networks: combined (In)direct employment rates, entrepreneurial skills and social landscape network(s) have increased and/or improved.	Employment	• Number of direct/indirect jobs created/supported* at the venture/landscape level (# jobs created/supported	• Activity report • Survey	 • Every 2 years
			Entrepreneurship	• # of people whose entrepreneurial and professional skills have been improved • # of participants in entrepreneurial and skills trainings, surveys	• Activity report	• Every 2 years
			Network	• Number of different groups connected to convey knowledge, information, and other support for innovation (# of network partners, e.g., Universities, community centers, Business schools, government etc.)	• Social mapping for both Enabling impact and Impact monitoring	
			Most Significant Change stories*	• MSC Stories show that by Return of Social Capital people have a deeper connection to their landscape		
3	Return of Natural Capital	Outcome indicator Improved holistic management:	Biodiversity	• Total area/hectares where abundance and diversity of	• Activity report • Data need to be collected from	• Annually • Every 5 years

Number of hectares (# ha) under improved management (aggregating the progress made on soil, biodiversity, water, and other)		species are improved/ maintained, • Type and number of practices initiated to improve and maintain biodiversity (# pro-biodiversity ha / # pro-biodiversity practices) • Species planted in different FLR options	the tree covered areas using Earth Mapathon & AI based wall-to-wall mapping for tree cover and land cover (biophysical change monitoring),	
			• GIS Survey	• Every 2 years
			• Field level observation	• Annually
	Soil Health	• Soil Organic Matter, pH, Cation-exchange capacity (CEC) values increase over 5 year time periods and visual assessments of soil structure and water drainage levels of the soil improve (change in SOM, pH, CEC, soil structure, and/or water drainage)	• Laboratory observation	• Every 5 years
	Water	• Improved water flow and / or improved water quality (m3 or % or another relevant unit)	• Volume of water flow • Laboratory testing	• Every 5 years
	Carbon	• Carbon is being sequestered into the landscape (tones of CO2 sequestered)	• Laboratory testing	
	Most Significant Change stories*	• MSC Stories show that by return of Natural Capital people have a		

				deeper connection to their landscape		
4	Return of Financial Capital	Outcome indicator Strengthened local economy: Combined sum of additional grant and/or commercial funding flows mobilized for integrated 4 returns landscape interventions (both direct and indirect/leveraged).	Business development	• Business cases are being identified, set up and/or tested** (# cases)	• Annual registration	
			Profitability	• Positive cash flows have been generated for the restorative (matured) business case(s) and/or there is room for reinvesting in the business (positive cash flow and/or reinvestment potential)	• Annual profit/loss statement	• Annually
			Investors	• IRR for investors is met for their respective thresholds (IRR met)	• Investment assessment	• Every 5 years
			Farmer Income	• Total increase in annual farmer income and/or beneficial cost/benefit ratio in favor of the farmer (amount or ratio)	• survey	• Every 2–5 years
			Most Significant Change stories*	• MSC Stories show that by return of Financial Capital people have a deeper connection to their landscape.		

5 RECOMMENDATIONS FOR NEXT STEPS AND CONCLUSION

Forest landscape restoration is critical for Sodo and Sodo Guragie Woredas due to over exploitation of the natural resources, where most of the landscape are remained bare, non-productive, and extremely degraded. Restoration efforts have been undergoing for more than three decades with insignificant accomplishment. New approaches and technological intervention would be very important to overcome the obstacles and improve the restoration activities. Innovative restoration financing mechanisms are critical to scale up restoration. Thus, the following recommendations are made:

- Giving special attention for the restoration of the remained patches of secondary forest of dry montane evergreen forest would be very important for the conservation of gene pool of these species.

- Strengthening of intra and inter-institutional coordination mechanisms at the woreda, regional, and national levels to tackle the different issues arising at all levels from lack of coordination, cooperation, and overlapping efforts.

- Capacity building of stakeholders and actors at each of these levels to design comprehensive strategies to integrate landscape restoration opportunities into multiple productive sectors.

- Assess the potential to introduce and promote alternative, short and medium-term rotations of economically productive tree plantations using alternate tree native/exotic species, including appropriate silvicultural practices.

- Assess the economic and physical potential to introduce high-value fruit-based bamboo agroforestry systems in agricultural areas.

- Establish of short rotation/economically productive communal and private woodlots, using existing structures, namely farmer training centers. Build the necessary capacity for provision of technical advice to farmers in district and kebele administrations, and in PFM cooperatives/groups.

- Integrating landless youth to markets through access to resources, capacity, and funds for forest-related activities such as forest enterprises, cooperatives for the production of timber and nontimber forest products. Identify potential for a role for the youth in the current situation of land scarcity.

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7 ANNEX I: INDIVIDUAL LANDSCAPE ZONING DETAILS

Brief description of each landscape zoning and their respective FLR potential tables are included in this annex.

7.1 DESCRIPTION OF THE HIGH ALTITUDE WURCH ZONE (DAF/EB/AA-WURCH-GET/GEB/SHE)

This high-altitude AA/EB/DAF-WURCH- GET/GEB/SHE (very cold with possible frost occurrences) zone consists of three PNV classes and three LHZ classes aggregated as one in WURCH Elevation class. About 16.3% land area of Sodo and Sodo Guragie falls in this category. This entire zone is the main sources of rivers, including Meki, which are emanating from highlands. This zone is constituted from the Afroalpine (AA) and Sub-Afroalpine (EB), and Dry Afromontane forest (DAF) PNV ecosystem categories. In the upper limits of the WURCH zone (3200 to 3700 m.a.s.l.) the woody vegetation is restricted by cold temperature it is primarily characterized by heather, *Erica arborea* and perennial herbs such as *Helichrysum* species (Mengesha Asefa, *et.al.* 2020). The lower limits of the WURCH is dominantly DAF where the elevation and slope values drop slightly and hence higher temperature as well. The DAF sub-zone is highly threatened by agricultural expansion and climate change. Barley is the only agricultural crop that grows in this altitudinal range. These areas are not suitable for widescale plantations due to frost occurrences.

Figure 10 | The DAF/EB/AA-WURCH-GET/GEB/SHE Zone

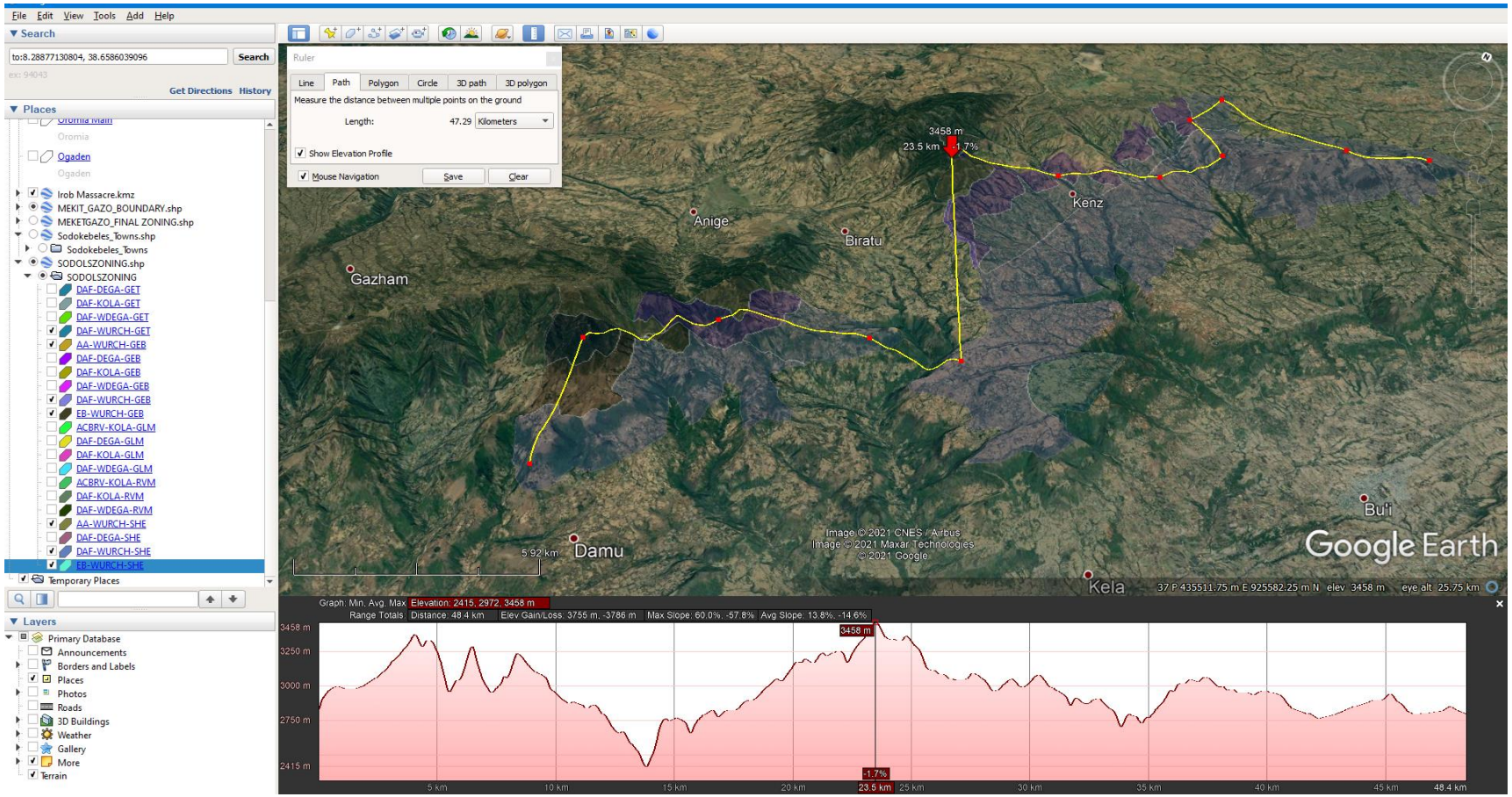
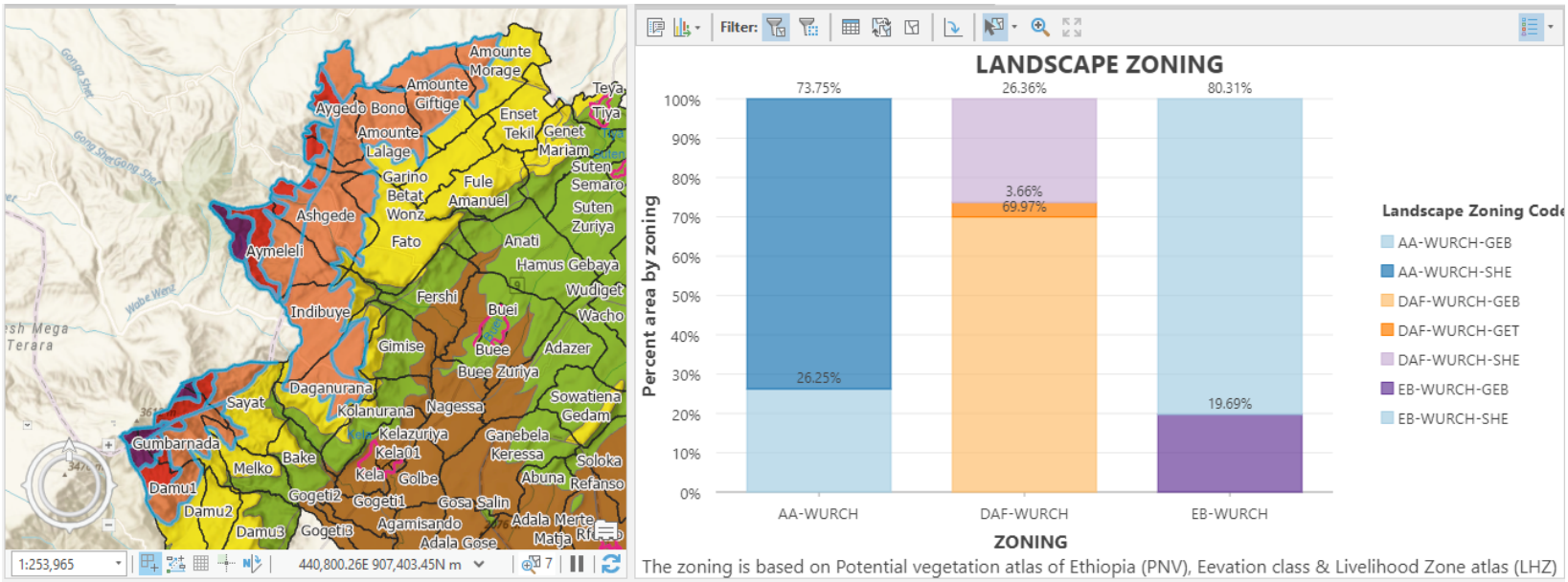


Figure 11 shows the selected polygon (blue boundary) representing this zone on the left and the graph of area proportion by secondary (PNV-ELV-LHZ) sub-zones on the right and the selected rows of the associated attribute table at the bottom.

Figure 11 | The DAF/EB/AA-WURCH-GET/GEB/SHE[26] Zone



The zoning is based on Potential vegetation atlas of Ethiopia (PNV), Eevation class & Livelihood Zone atlas (LHZ)

SODO_PNVDEMLHZ042221

Field: Add Calculate | Selection: Select By Attributes Zoom To Switch Clear Delete Copy | Highlighted: Unselect Reselect Zoom To Switch Clear Delete

NEW ZONING	PNV LABEL	TRD ALTITUDE	PN CODE	LZCODE	REGION	LHZ Description	LS ZONING	ELEVATION CLASS	ZONE AREA (ha)
DAF-WURCH	(5) Dry evergreen Afromontane forest and grassland complex (DAF)	WURCH	DAF	GET	SNNPR	Gurage-Siltie Enset and Teff LZ	DAF-WURCH-GET	3,607	451
AA-WURCH	(9) Afroalpine belt (AA)	WURCH	AA	GEB	SNNPR	Gurage-Siltie Highland Enset and Barley LZ	AA-WURCH-GEB	3,607	239
DAF-WURCH	(5) Dry evergreen Afromontane forest and grassland complex (DAF)	WURCH	DAF	GEB	SNNPR	Gurage-Siltie Highland Enset and Barley LZ	DAF-WURCH-GEB	3,607	8,609
EB-WURCH	(8) Ericaceous belt (EB)	WURCH	EB	GEB	SNNPR	Gurage-Siltie Highland Enset and Barley LZ	EB-WURCH-GEB	3,607	425
AA-WURCH	(9) Afroalpine belt (AA)	WURCH	AA	SHE	Oromiya	Soddo Highland Wheat, Barley & Enset	AA-WURCH-SHE	3,607	671
DAF-WURCH	(5) Dry evergreen Afromontane forest and grassland complex (DAF)	WURCH	DAF	SHE	Oromiya	Soddo Highland Wheat, Barley & Enset	DAF-WURCH-SHE	3,607	3,244
EB-WURCH	(8) Ericaceous belt (EB)	WURCH	EB	SHE	Oromiya	Soddo Highland Wheat, Barley & Enset	EB-WURCH-SHE	3,607	1,733

[27]

[26] " DAF/EB/AA-WURCH-GET/GEB/SHE": "/" sign shows that in a given zone multiple but closely resembling classes of the single input layer/map (i.e. PNV, ELV or LHZ) are aggregated and treated as one while "-" sign shows the combined class from the three input layers (PNV, ELV & LHZ)). E.g., for the above zoning, DAF/EB/AA-WURCH-GET/GEB/SHE, three classes of PNV (DAF/EB/AA) and three classes of LHZ (GET/GEB/SHE) are aggregated and treated as one which is combined with one class of ELV which is WURCH here. Technically each class could be treated individually and draw a factorial combination as is, but the number of zoning would be unmanageable.

[27] Key to the column headings of the highlighted attribute tables: ***NEW ZONING = PNV-ELV, TRD ALTITUDE = ELV, PN CODE = PNV code, LZ CODE = Livelihood Zone Atlas (LHZ) codes, LS ZONING (Landscape Zoning) = PNV-ELV-LHZ***

7.2 FLR POTENTIAL FOR THE DAF/EB/AA-WURCH-GET/GEB/SHE ZONE

The main FLR intervention for the upper limits of this zone are managing Afroalpine (AA) and Ericaceae belt (EB) to restore degraded native vegetation growing along the rides of the woredas and promotion of bamboo plantation at the foothills of these rides. Accordingly, about 2,538ha was identified to put under improved management primarily to restore native biodiversity and hydrological systems (Table 12).

The lower elevations of this zone (DAF-WURCH-GET/GEB/SHE) Sub-zone has around 11,000ha of potential split among highland bamboo restoration (HLB), Restoration of Secondary Forest (RSF), Agroforestry (AF), and Woodlots (WLE) (Table 12). As a vision, this zone should try to prioritize for the former two interventions (HLB and RSF) since its hydrological importance is significant as headwater source of the Rift Valley lakes on steep slopes of high elevation.

Table 12 | DAF/EB/AA-WURCH-GET/GEB/SHE FLR Potential

PNV-ELV ZONING	PNV-ELV-LHZ ZONING							GRAND TOTAL
		AA-WURCH-GEB		AA-WURCH-SHE		EB-WURCH-GEB	EB-WURCH-SHE	
		FIELD REFINED FLR						
	MAPPED FLR	HLB_RSF_SHL		HLB_RSF_SHL	RSF_SHL	HLB_RSF_SHL	RSF_SHL	HLB_RSF_SHL	RSF_SHL	
AA-WURCH	AF_HLB				7					7
	HLB		91	527						618
	SHL_HLB		1	6						7
EB-WURCH	AF_HLB						95		373	467
	AF_HLB_RSF						9		61	70
	AF_RSF								0	0
	AF_WLE								30	30

	AF_WLE_HLB							11	11
	AF_WLE_HLB_RSF							2	2
	AF_WLE_RSF							11	11
	HLB				216		900		1,116
	HLB_RSF				16		82		98
	RSF						1		1
	SHL						4		4
	SHL_HLB				12		52		64
	SHL_HLB_RSF				4		17		21
	SHL_RSF						1		1
	WLE						5		5
	WLE_HLB						2		2
	WLE_HLB_RSF						0		0
	WLE_RSF						2		2
GRAND TOTAL		**92**	**533**	**7**	**248**	**104**	**1,067**	**488**	**2,538**

PNV-ELV ZONING	**MAPPED FLR**	**PNV-ELV-LHZ ZONING**								**FLRAREA (ha)**
		DAF-WURCH-GEB			**DAF-WURCH-GET**			**DAF-WURCH-SHE**		
		REFINED FLR								
		HLB_RSF_SHL	**HLB_WLE_RSF**	**HLB_WLE_RSF_SHL**	**HLB_RSF_SHL**	**HLB_WLE_RSF**	**HLB_WLE_RSF_SHL**	**HLB_RSF_SHL**	**HLB_WLE_RSF**	**HLB_WLE_RSF_SHL**
DAF-WURCH	**AF_HLB**		62						9		71
	AF_HLB_RSF		560			6			682		1,248

	AF_RSF	483			53			92			628
	AF_WLE	2						6			8
	AF_WLE_HLB	17						0			18
	AF_WLE_HLB_RSF	371						334			705
	AF_WLE_RSF	1,325			173			94			1,592
	HLB			1,195		0	4		2	541	1,743
	HLB_RSF			969		0	3		1	712	1,685
	RSF		9	638		1	46			81	776
	SHL			0						2	2
	SHL_HLB			7						3	10
	SHL_HLB_RSF		2	200			0		1	172	375
	SHL_RSF		2	270		0	17			21	311
	WLE			2						5	7
	WLE_HLB			5						1	5
	WLE_HLB_RSF		5	400					1	186	592
	WLE_RSF		6	1,087		0	87			60	1,240
GRAND TOTAL		**2,820**	**25**	**4,774**	**232**	**2**	**158**	**1,217**	**5**	**1,783**	**11,016**

7.3 DESCRIPTION OF THE DEGA ZONE (DAF-DEGA-GET/GEB/GLM/SHE)

The DEGA zone (cold) represents a complex system of successions involving extensive grasslands rich in legumes, shrubs and small to large-sized trees to closed forest with a canopy of several strata occurring between 2325-2625 meters altitude. The areas with Dry Afromontane Forest (DAF) have canopies usually dominated by Tid *(Junipernsprocerd)* as a dominant species, followed by Weira (*Olea europaea* subsp. *cuspidata*), etc. Zigba (*Podocarpusfalcatus*), in its original natural environment, is also found in sheltered valleys.

This zone is densely populated and heavily cultivated resulting in increased demand for food, wood, and other ecological, economic, and social services, that in turn resulted in forest degradation by expanding agriculture, overgrazing, fuelwood, and construction material extraction. In the other hand, the Dry Afromontane Forests (DAF) are very important for provision of different ecosystem goods (wood products, income generation, etc.) and services (climate change, soil and water conservation, biodiversity conservation, etc.).

Figure 12 | Google Earth View of the DAF-DEGA-GET/GEB/GLM/SHE Zone

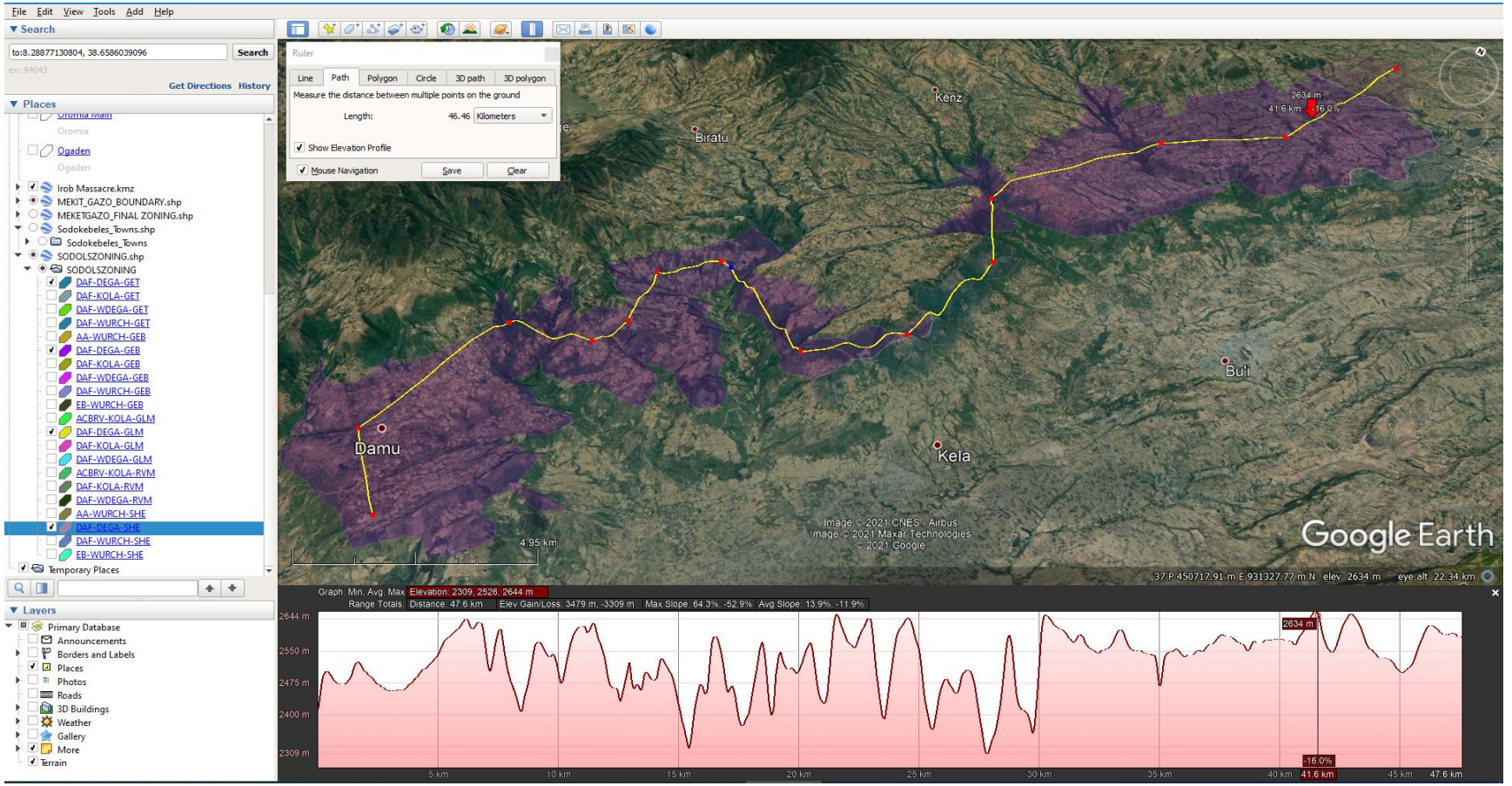
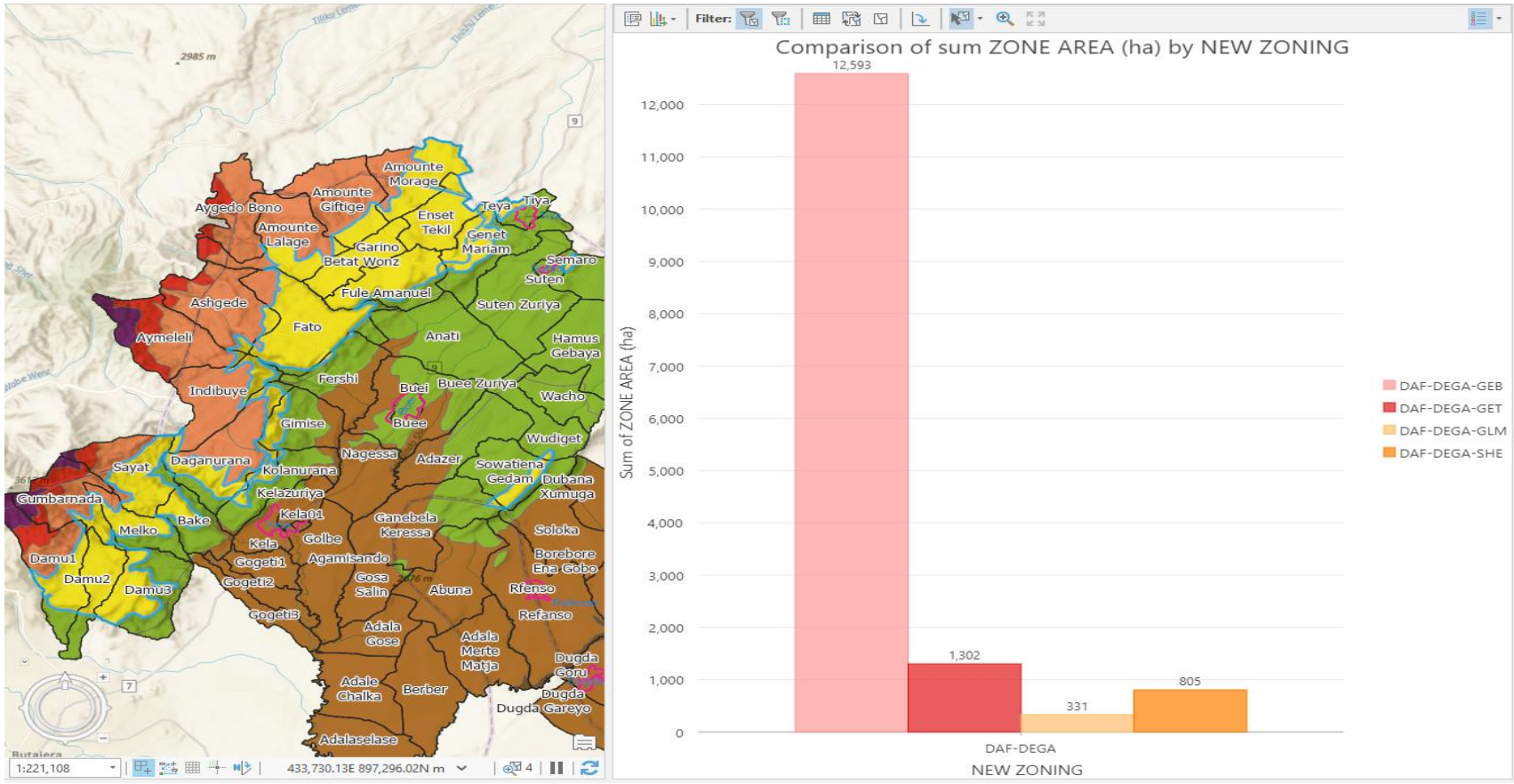


Figure 13 shows the selected polygon (blue boundary) representing this zone on the left and the graph of area proportion by secondary (PNV-ELV-LHZ) sub-zones on the right.

Figure 13 | Map View of the DAF-DEGA-GET/GEB/GLM/SHE Zone



Note: *the "New Zoning" in the X-axis title in these graphs refer to the PNV-ELV (two factor- elevation & potential natural vegetation atlas) based 1st order/primary zoning, and the legend on the graph refers to the 2nd order Zoning that further stratifies the 1st order zoning by adding the "LHZ" (livelihood Zone Atlas) as a third factor.*

7.4 FLR POTENTIAL FOR DAF-DEGA-GET/GEB/GLM/SHE ZONE

Different FLR options can be practiced for restoration of ecosystems, sustainable use of natural resources. According about 13,733ha of potential has been identified split among four interventions in this zone. i.e., Restoration of Secondary Forest (RSF), Highland Bamboo (HLB), Agroforestry promotion (AF), and Woodlots development (WLE) (Table 13). There are steep slope areas specially around the edges of "DAF-DEGA-GEB" sub-zone, where RSF should be prioritized.

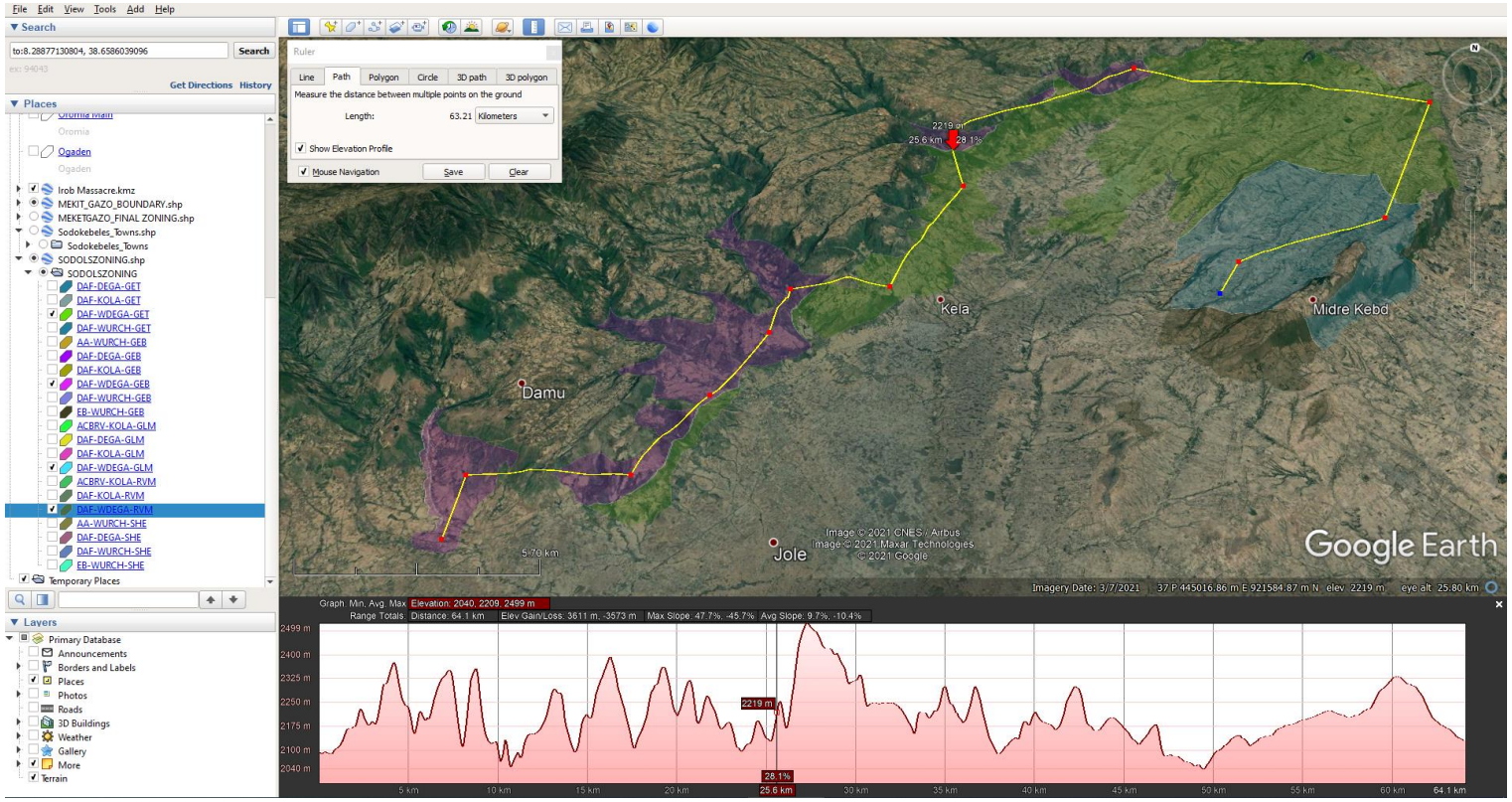
Table 13 | DAF-DEGA-GET/GEB/GLM/SHE FLR Potential

		PNV-ELV-LHZ ZONING										
		DAF-DEGA-GEB			DAF-DEGA-GET					DAF-DEGA-SHE		
		REFINED FLR										
PNV-ELV ZONING	MAPPED FLR	HLB_AF_RSF	HLB_WLE_RSF_AF	HLB_WLE_RSF_SHL	HLB_AF_RSF	HLB_RSF	HLB_WLE_RSF	HLB_WLE_RSF_AF	HLB_WLE_RSF	HLB_WLE_RSF_AF	HLB_WLE_RSF_AF	Mapped FLR Total (ha)
DAF-DEGA	AF_HLB_RSF	1	457			1	12					**471**
	AF_RSF	0	489				15					**504**
	AF_WLE_HLB_RSF	2	1,902			13	318		197		318	**2,749**
	AF_WLE_RSF		680			0	16					**696**
	HLB	31	2,082	23	29			187		19	64	**2,435**
	HLB_RSF	14	1,582	9	12			149		32	27	**1,825**
	RSF	0	867	11	1			66				**945**
	SHL_HLB_RSF	7	574	3	5			68		14	22	**693**
	SHL_RSF	0	191	3	0			17				**212**
	WLE_HLB_RSF	4	2,158	6	11			197		65	188	**2,630**
	WLE_RSF	0	549	6				18				**573**
REFINED FLR TOTAL		**60**	**11,531**	**62**	**58**	**14**	**361**	**701**	**197**	**130**	**619**	**13,733**

7.5 DESCRIPTION OF THE WOINA DEGA (DAF-WDEGA-GET/GEB/GLM/RVM) ZONE

The WOINA DEGA (Temperate) zone just below the DEGA zone is situated in the elevation range of 2015m to 2325m with average monthly temperature of 20°C during the warmest months and characterized by gently sloping topography. Dominantly undulating plateaus but considerable area around upper limits of this zone is also characterized by relatively steep slopes. The main natural tree species identified in this sub-zone are: *Acacia spp, Ficus spp*, *Junipurus procera*, *Podocarpus falcatus*, Phoenix, *Cordia africana*, Albizia, *Croton macrostachys*, and Erythrina sp., etc.

Figure 14 | Google Earth View of DAF-WDEGA-GET/GEB/GLM/RVM Zone



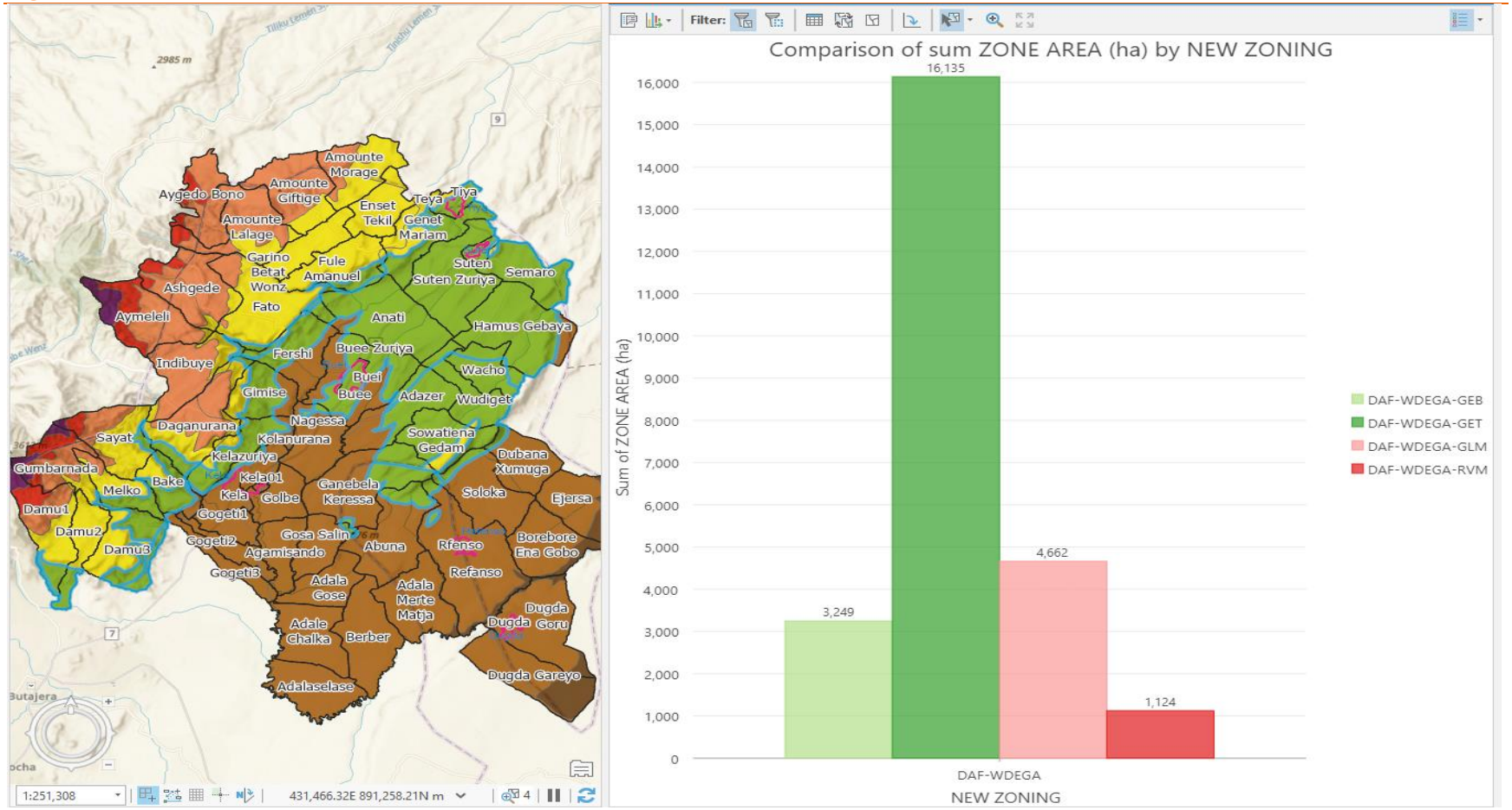
This zone is extensively cultivated and would benefit from incorporating agroforestry into cropping. The dominant livelihood zone is the "-Siltie Enset and Teff LZ" (GET) based. Enset (Ensete ventricosum) is a popular perennial agroforestry crop in this region.

"-- it is a perennial crop indigenous to Ethiopia. Enset is called the "false banana" because of its similarity in appearance. However, it is usually taller and fatter, with no edible fruits[28]. Over time, it has ranked as the most important cultivated staple food crop in the highlands of central, south, and southwestern Ethiopia. It has been discovered to be weather resistant, which earned enset (AKA False Banana) another title: "the tree against hunger"."

[28] FALSE BANANA BRINGS FOOD SECURITY IN ETHIOPIA

Figure 15 shows the selected polygon representing this zone on the left and the graph of area proportion by secondary (PNV-ELV-LHZ) sub-zones on the right.

Figure 15 | Map View of DAF-WDEGA-GET/GEB/GLM/RVM Zone



7.6 FLR POTENTIAL FOR DAF-WDEGA-GET/GEB/GLM/RVM ZONE

According to current study (BAGER 2021), about 21,035ha of landscape has been identified for FLR interventions, through WLE, RSF and AF (Table 14).

Table 14 | DAF-WDEGA-GET/GEB/GLM/RVM FLR Potential

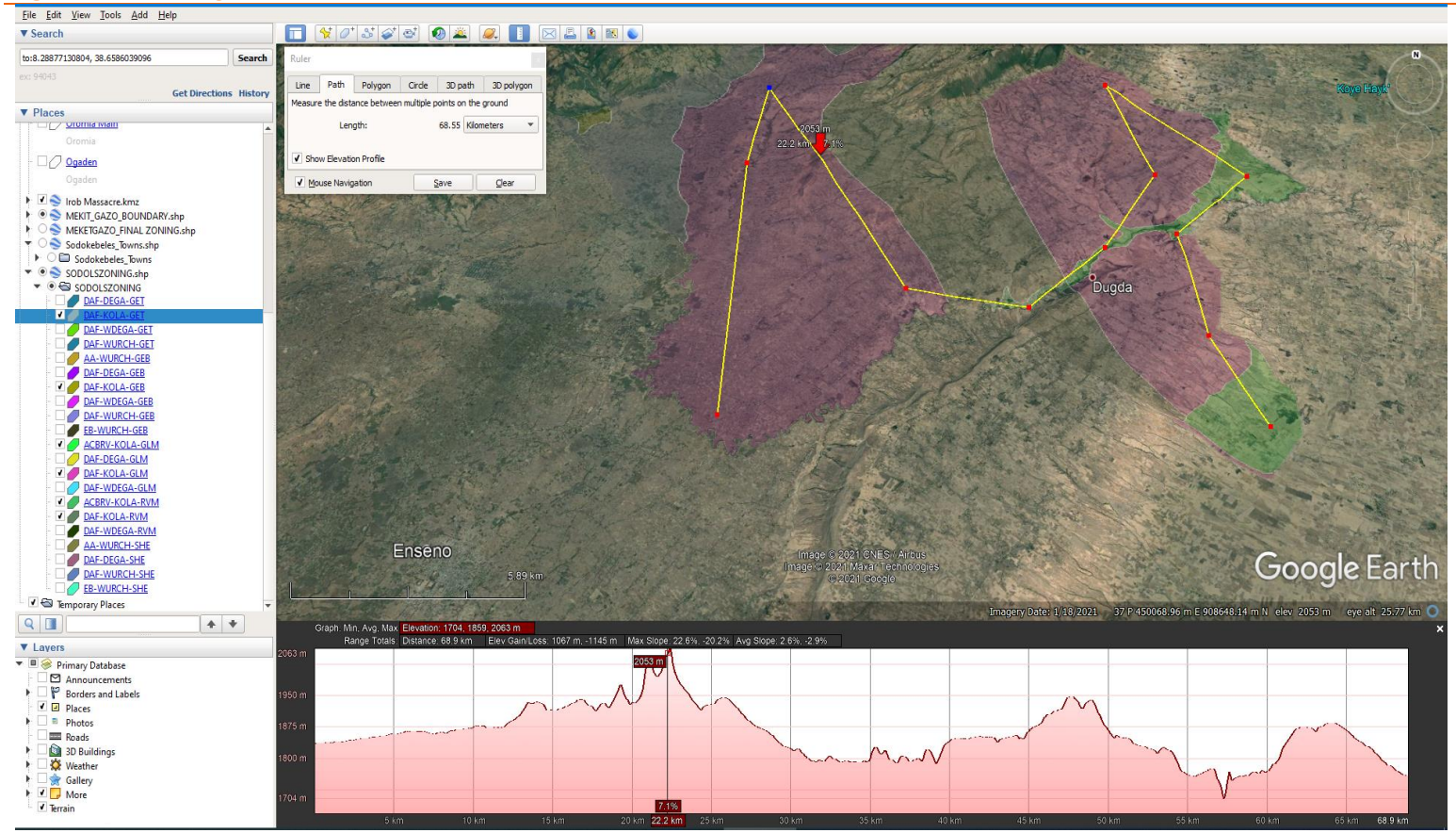
		PNV-ELV-LHZ ZONING											MAPPED FLR (HA)
		DAF-WDEGA-GEB		DAF-WDEGA-GET			DAF-WDEGA-GLM			DAF-WDEGA-RVM			
		REFINED FLR											
PNV-ELV ZONING	MAPPED FLR	AF_RSF	WLE_RSF_AF	AF_RSF	AF_RSF_WLE	WLE_RSF_AF	AF_RSF	AF_RSF_WLE	WLE_RSF_AF	AF_RSF	AF_RSF_WLE	WLE_RSF_AF	
DAF-WDEGA	AF_HLB_RSF	45	0	308		1	73			95		2	**479**
	AF_RSF	187		1,745	10		298	0		672	51		**2,776**
	AF_WLE_HLB_RSF	156	2	1,649		6	1,914		1	5		33	**3,609**
	AF_WLE_RSF	271		6,541	30	1	1,157	6		18	0		**7,752**
	HLB	549	17	341		10	49		1	2		0	**420**
	HLB_RSF	419	16	692		17	206		1	38		3	**974**
	RSF	463	1	1,495	12	1	306	1		137	7		**1,961**
	SHL_HLB_RSF	154	6			267			69			11	**354**
	SHL_RSF	145	0	514	4	0	68	0		26	1		**615**
	WLE_HLB_RSF	175	6			585			295			7	**892**
	WLE_RSF	166		1,049	6	1	144	1		5			**1,204**
REFINED FLR (HA)		**2,729**	**48**	**14,334**	**62**	**889**	**4,215**	**8**	**367**	**998**	**60**	**55**	**21,035**

7.7 DESCRIPTION OF THE KOLA ZONE (DAF/ACBRV-KOLA-GET/GEB/GLM/RVM)

The KOLA (Warm) zone constitutes the lowest elevation (1669m to 2015m) areas of the Woredas. Moisture is a limiting ecological factor in this zone. This ecosystem is characterized by drought resistant trees and shrubs, either deciduous or with small, evergreen

leaves occurring. The wooded grasslands of the Rift Valley consist of a tree stratum mainly, or almost entirely, dominated by species of *Acacia* over a grass stratum. in which *Acacia albida* and *A. tortilis* are common. When not heavily influenced by man, the canopy of *Acacia wooded grassland of the Rift Valley* is more closed.

Figure 16 | Google Earth View of DAF/ACBRV-KOLA-GET/GEB/GLM/RVM Zone

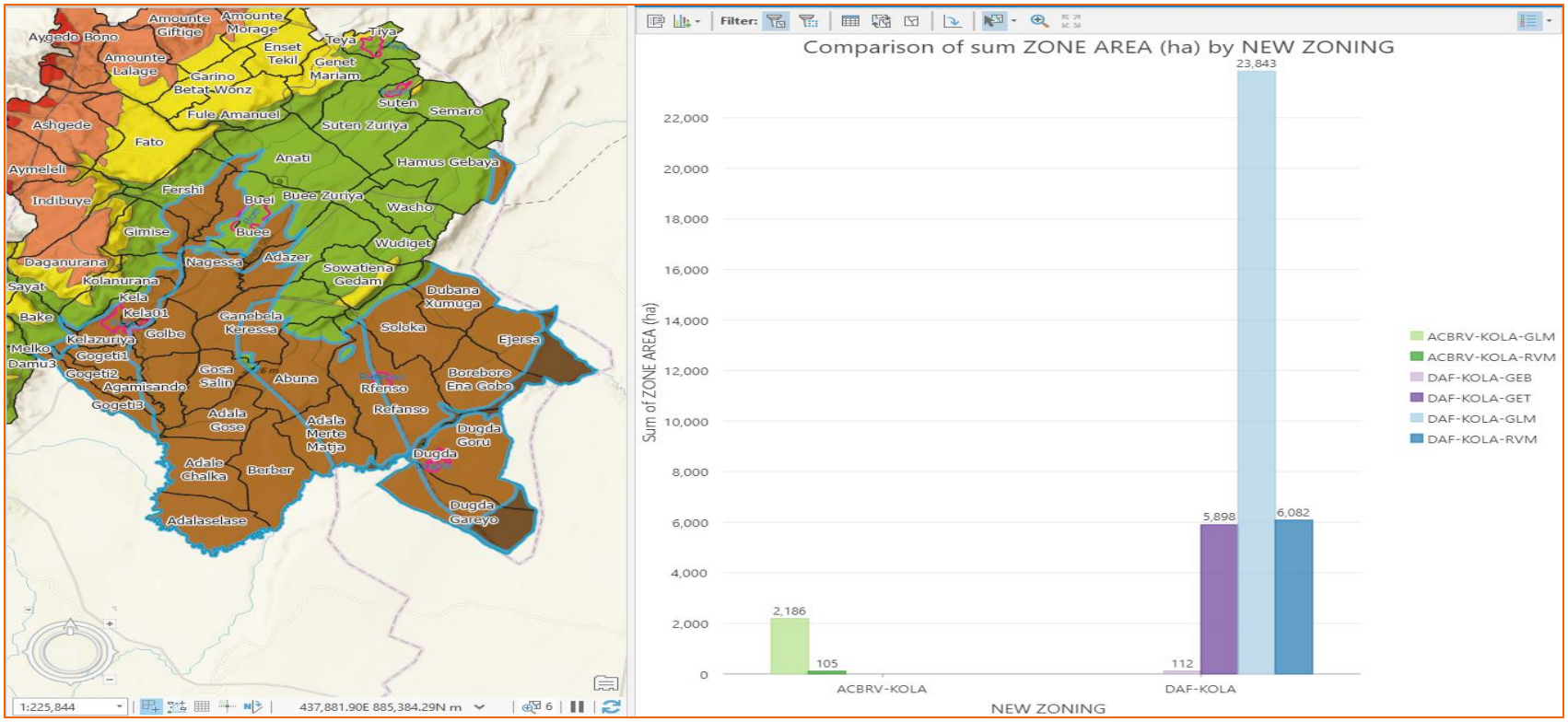


There are many succulent and other drought-tolerant species on these lava-flows. The tree stratum consists mainly of *Acacia etbaica, A. seyal,A. albida, A. tortilis*, *A. Senegal,* etc. (all Fabaceae subfam. Mimosoideae). Other genera are *Croton* (especially *C. dichogamus*), and a candelabra- shaped *Euphorbia* (both Euphorbiaceae). The grasses belong mainly to the genera *Hyparrhenia.* Other genera are *Croton* (especially *C. dichogamus*), and a candelabra- shaped *Euphorbia* (both Euphorbiaceae). The grasses belong mainly to the

genera *Hyparrhenia.* Acacia albida is a magic tree that can be used as fodder as well as nitrogen fixing purposes with alternate phenology. Hence, a great candidate species for agroforestry in this zone.

Figure 17 shows the selected polygon representing this zone on the left and the graph of area proportion by secondary (PNV-ELV-LHZ) sub-zones on the right.

Figure 17 | Map View of the DAF/ACBRV-KOLA-GET/GEB/GLM/RVM Zone



7.8 FLR POTENTIAL FOR DAF/ACBRV-KOLA-GET/GEB/GLM/RVM ZONE

Restoration of secondary forest (Acacia woodlands) (RSF), Agroforestry promotion (AF) and woodlots (WLE) are the main interventions recommended in this zone. There is about 36,929ha of potential split among the three interventions in the entire study area (Table 15).

Table 15 | DAF/ACBRV-KOLA-GET/GEB/GLM/RVM FLR Potential

		PNV-ELV-LHZ ZONING															GRAND TOTAL
		ACBRV-KOLA-GLM		ACBRV-KOLA-RVM	DAF-KOLA-GEB		DAF-KOLA-GET			DAF-KOLA-GLM			DAF-KOLA-RVM				
		REFINED FLR															
PNV-ELV ZONING	MAPPED FLR	AF_RSF_WLE	AF_WLE	AF_WLE	AF_RSF_WLE	AF_WLE	AF_RSF	AF_RSF_WLE	AF_WLE	AF_RSF	AF_RSF_WLE	AF_WLE	AF_RSF	AF_RSF_WLE	AF_WLE		
ACBRV-KOLA	AF_RSF		1,454	43													**1,497**
	AF_WLE_RSF		87	22													**109**
	RSF		522	23													**545**
	WLE_RSF	11															**11**
DAF-KOLA	AF_RSF						14		1,064	32		9,290	15		4,239		**14,654**
	AF_WLE_RSF					60	42		3,487	7		11,913			1,253		**16,760**
	RSF					18	18		376	29		1,560	1		352		**2,353**
	SHL_RSF				6		5	114		1	107			22			**255**
	WLE_RSF				15		16	375		0	324			14			**744**
		11	**2,064**	**88**	**21**	**78**	**95**	**490**	**4,927**	**68**	**431**	**22,762**	**16**	**36**	**5,843**		**36,929**

8 ANNEX II: LIST OF PARTICIPANTS

NR.	PARTICIPANT NAME	ORGANIZATION	RESPONSIBILITY
1	Hailu Teka	Water, Energy and mining	Agronomist
2	Musad Amed	Water, Energy and mining	
3	Shifera Fekada	Water, Energy and mining	Engineer
4	Adam Arada	Land administration	Coordinator
5	Zinash Seuse	Environmental protection forest	Natural Forest Management Expert
6	Danshute Musuret	Women, Children and Youth office	Gender and Development Expert
7	Birhanu Bete	Farm and Natural Resource Coordination Office	V/Head
8	Andualem Teshome	Environmental Protection and Forest	Forester
9	Zeirhun Fikire	Environmental Protection and Forest	Agroforest expert
10	Demsew Gizachew	Animal and Fishery Resource Office	Forage development expert
11	Tadle Tekle	Animal and Fishery Resource Office	Forage development expert
12	Habtamu Kausu	Kebele Administration	Farmer
13	Alemayehu Haile	Agricultural natural office	V/Head
14	Shawaye Amare	Agricultural natural office	Planning Expert
15	Ewnetu Kornel	Natural resource management	Head
16	Huluagersh Assefa	W/C/Youth office	Manager
17	Tarkeegn Shrmrkit	Cooperative Office	Office Head
18	Degnet Chrinet	FSDP	Socio economics expert
19	Tariku Girma	Women, Children, Youth office	Expert
20	Solomon Abera	Environmental Protection and Forest Office	Expert
21	Gashaw Terfe	Public Prosecutor	
22	Zekarrab Doti	Water and mining	Office head
23	Zeinna Jemal		
24	Zewdu Wossene	Agriculture Office	Irrigation engineer
25	Million Amare	FIDP	Forster
26	Getachew Teka	Woreda Administration	Head, Administrator
27	Almeyehu Negash	HRM	
28	Etagnew Tadesse		
29	Zewdu Mulatu	Environment	Coordinator

NR.	PARTICIPANT NAME	ORGANIZATION	RESPONSIBILITY
30	Haile Jamire	Environmental Protection and Forest Office	Coordinator
31	Dessie Abegaz	Agriculture Natural Resource Office	Head
32	Desfiyntnu Nokago	Agriculture Natural Resource Office	
33	Feleke Shimekit	Plan and Economic	Office head
34	Almayehu Nagene	Water and mining	Water resource expert
35	Wolde Negesh	Environmental Protection and Forest Office	Head
36	Belyaneh Yilma	Sodo Guragie Woreda Administration	Head. Administrator
37	Neway Sime	BOFED	Office Head
38	Belete Tades	Environmental protection	Office head
39	Tariku Beressa	Micro Enterprise	Head
40	Bekele Kidane	Environment Protection and forest	Process owner
41	Astash Burka	Cooperative Office	Office head
42	AnbeseTsgaye	Livestock and Fishery	Expert
43	Biruk Amare	Environmental Protection	Expert
44	Melese Fekier	Afriforest	Team leader
45	Mulugeta Shanko	Agriforest	Department head, Soil Conservation
46	Shile Wondimagegne	Agriforest	Department
47	Workenehi Dessalegn	Plan and Economic Development	Office Head
48	Zerihun Kifle	BOANR	Agronomist
49	Ayinalem Felke	Environment Protection Forest	Natural forest management expert
50	Endale Gezaghne	Environment Protection Forest	Natural forest management expert
51	Sisay Abush	Environment Protection Forest	Biodiversity
52	Eskedar Sisay	WCY Office	Head
53	Hailu Seifu	Agriculture and Natural Resource Office	Office Head
54	Bizuneh Mulugeta	Agriculture Office	Expert
55	Assefa Edao	Damu 1st Kebele	Farmer
56	Awah Kumbl	Damu 2nd Kebele	Farmer
57	Samson Abera	Water and Irrigation	Irrigation engineer