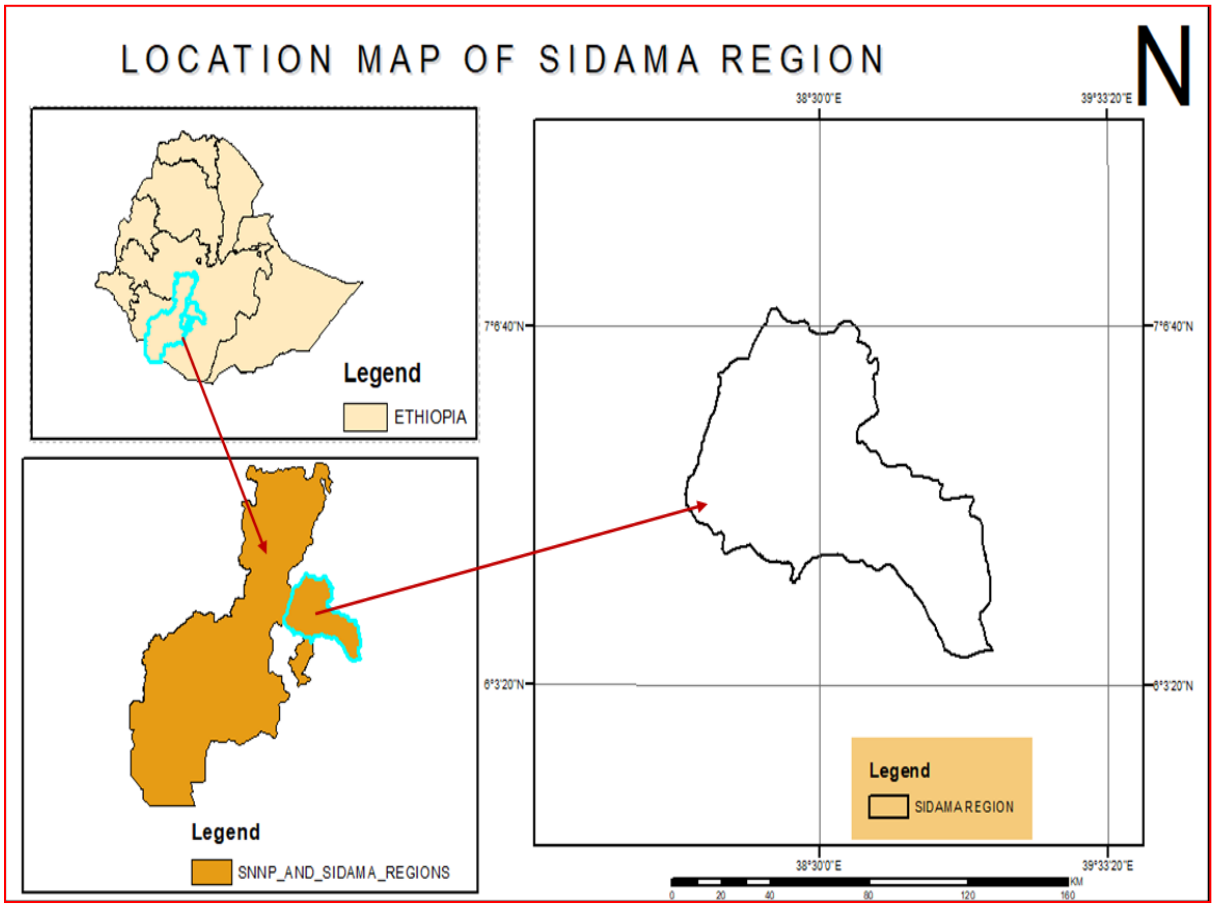
Environmental Protection Authority

State of Environment and Natural resource data preparation desk.

Report on Status, Challenges and counter measures In Natural Resource in SidamaRegion



Addis Abeba 2024

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Acronym and Abbreviations

ATA: -------Agricultural Transformation Agency

AWSF: -----AbboWonshoSidama Forest

FAO: -------Food Agricultural Organization

GDP: -------Gross Domestic Product

Ha: ----------hectare

LULC: -----Land Use Land Cover

Q: ----------Quintal

SDG: ------Sustainable Development Goal

SWC: -----Soil and Water Conservation

1. General Back ground

Sidama National Region State is one of the regions in Ethiopia which is located in the northeast of Lake Abaya and southeast of Lake Hawassa. The region is geographically located between $6^0$05‟ and $7^0$10‟ north of latitude and $38^0$0‟ and $39^0$10‟ east of Longitude. It is bordered on the north, east and on the south by the Oromia Region except for a short stretch in the middle where it shares a border with Gedeo zone. The Sidama Region is one of the most densely populated regions of the country of which in average 674 persons are living in a square kilometre. Even within the region there is a great variation in population density from Woreda to Woreda.

The Sidama region, renowned for its abundant natural resources, boasts a variety of hot springs, mines, precious minerals, forests, and an immense variety of water bodies, including Lake Hawaasa. Some of the available but not fully studied mines and mineral resources in the region are rock aggregates/rhyolites, hot springs, sand, diatomite, basalt, and gold. Specifically, gold and other minerals are found in Bansa, Chabbe, and Hookko districts of the region. In general, the Sidaama National Regional State is abundant in minerals with immense economic benefits and promising prospects. Coffee, the region's primary cash crop, is the primary source of livelihood for rural inhabitants.These studies focused on Sidama region land, forests, water, minerals, and their natural status, and included challenges and responses as follows.

2. Status of Land Degradation

Introduction

Land degradation manifested in terms of soil erosion, nutrient depletion, gully formation, water scarcity, and reduction in yield of crop and desertification.

Land degradation affects millions of rural Ethiopian people. The minimum estimated annual cost of land degradation in Ethiopia is 2-3% of agricultural gross domestic product (GDP), before accounting for downstream effects such as increased flood risk. By reducing soil fertility and agricultural yields, land degradation undermines livelihood security. Ethiopia has made significant progress over the past 13 years to restore degraded watersheds. Successful remediation has been achieved through funding for the warranted expansion of safety nets and employment support. Since the 1970s, the Government of Ethiopia has recognized the problem

of land degradation as a major challenge to the country's growth and stability. Due to its impact on agricultural productivity alone, soil erosion currently costs the economy of Ethiopia about $305 million per year (World Bank, 2020).

Sidama region has also has a long history of land use with high erosion damage in some parts of it. Land degradation is extremely widespread with frequent gullies. Grasslands are overgrazed with bushy vegetation and low undercover. Re-vegetation is a major problem due to cattle (goats, sheep) grazing and low moisture availability, Improper cultivation practices (slope cultivation with insufficient soil and water conservation measures and erosion/runoff control measures) are the main cause of land degradation.

LOCATION OF THE REGION

The Sidama Region is a regional state in southern Ethiopia. It was formed on 18 June 2020 from the Southern Nations, Nationalities, and Peoples' Region of Ethiopia. Sidama region has geographic coordinates of latitude, north: 5'45" and 6'45" and longitude, East, 38' and 39' and it is bordered on the south by the Oromia Region, on the west by the Bilate River, which separates it from Wolayita zone, and on the north and east by the Oromia Region.

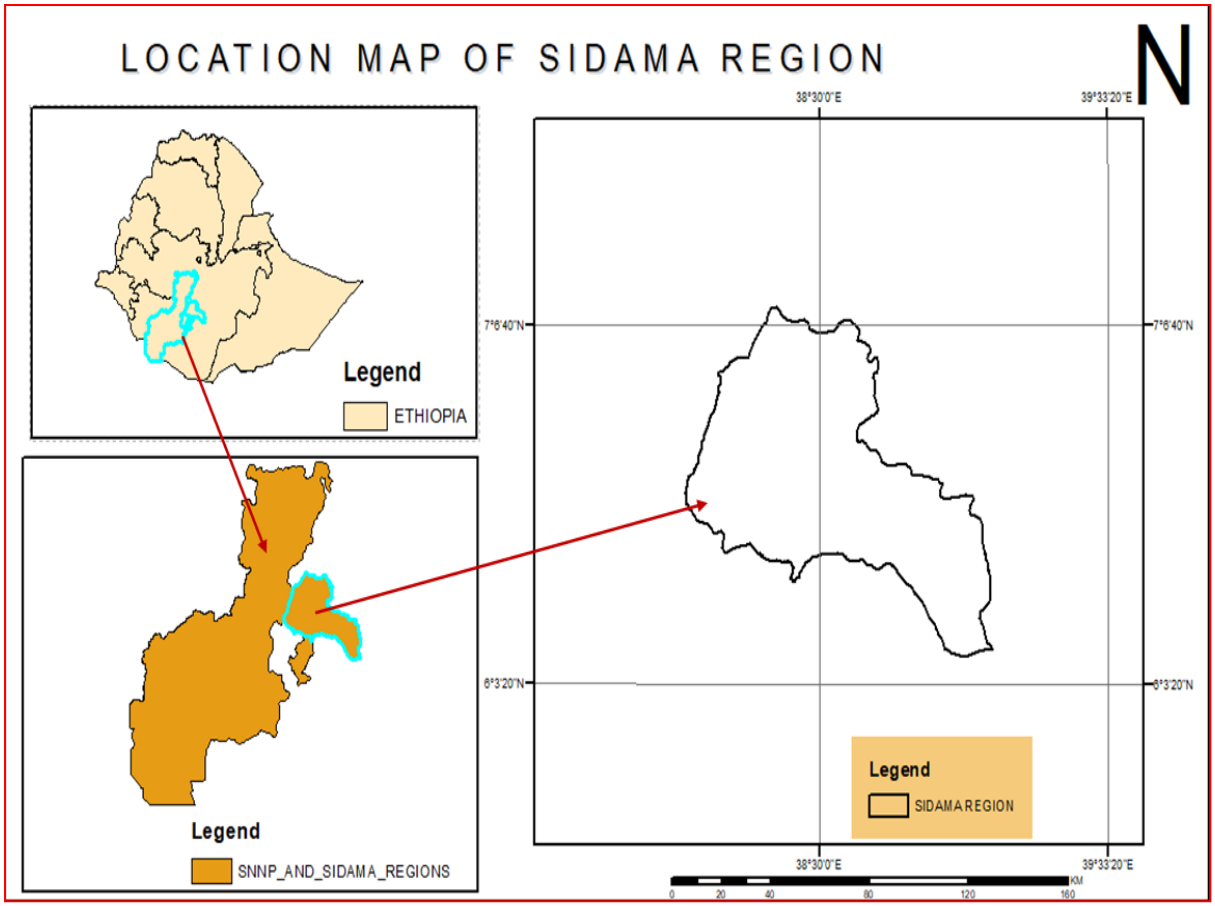

Figure 1: Location map of Sidama region

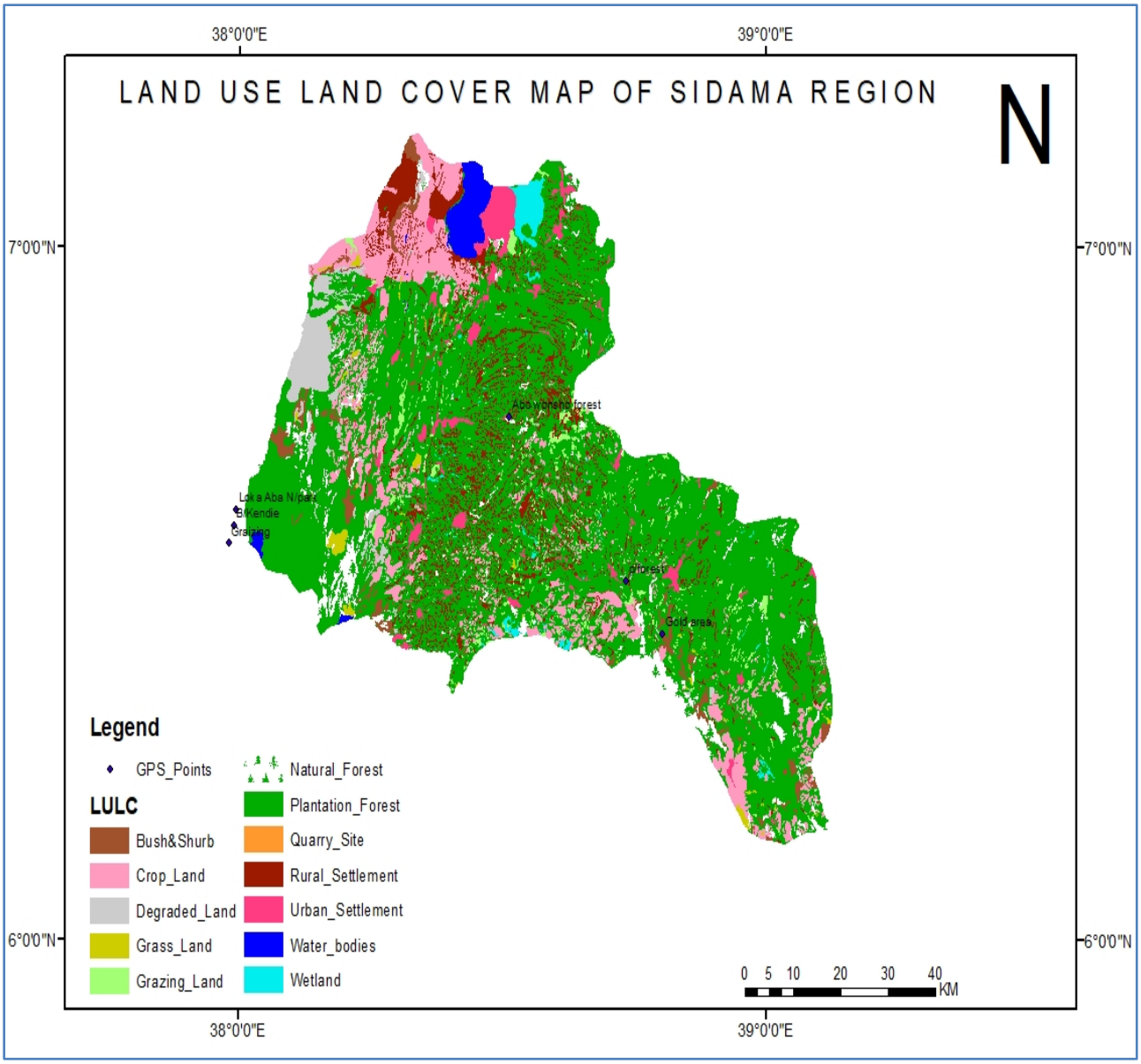

Figure 2: Land use Land cover map of Sidama region

Table 1: Land use type and area coverage of Sidama region.

No	Land use Type	Area in Ha	Area Coverage in %
1	Bush & shrub land	18,268.49	2.70
2	Crop land	68,540.51	10.12
3	Degraded land	19,555.68	2.89
4	Grazing land	14,404.34	2.13
5	Grass land	4,155.04	0.61
6	Natural Forest	25,427.45	3.76
7	Planation Forest	432,912.59	63.95
8	Quarry site	344.59	0.05

9	Rural settlement	57,093.41	8.43
10	Urban settlement	18,571.08	2.74
11	Water bodies	10,241.59	1.51
12	Wet land	7490.84	1.11
	Grand Total	**677,005.61**	**100**

Table 2:Some selected reference areas of the region during data collection process.

No	Name of Investment site	X-coordinate	Y-coordinate	Elevation
1	BelaynehKindie farm investment	388287	729377	1197
2	Grazing land	387242	626574	1189
3	Gold potential area of the region	478267	712008	1801
4	Protected plantation forest	470781	720514	1976
5	Abo wonsho protected forest	446228	746802	2028
6	Loka Abaya National park	388778	731990	1247

Figure 3: some selected reference areas of the region

2.1 Major Challenges of Land Degradation InSidam Region

As the study of participatory development of productive land escape, sidama region has the weathering of volcanic deposits produced fertile and deep Nitisols and Vertisols. These are the most common soil types found on the region. Both soil types are extremely prone to erosion when not vegetated. In the region there is:-

- ✓ *Strongly acidic soils (low pH)*
- ✓ *Nitrogen (N) deficiency*
- ✓ *Phosphorus (P) deficiency*

- ✓ *Low content of organic matter*
- ✓ As we detected from Arc map, the land was affected by degradation is about 19,555.68ha (2.89%), by dry of wet land 875.5 ha (25%), from the total area of the region.

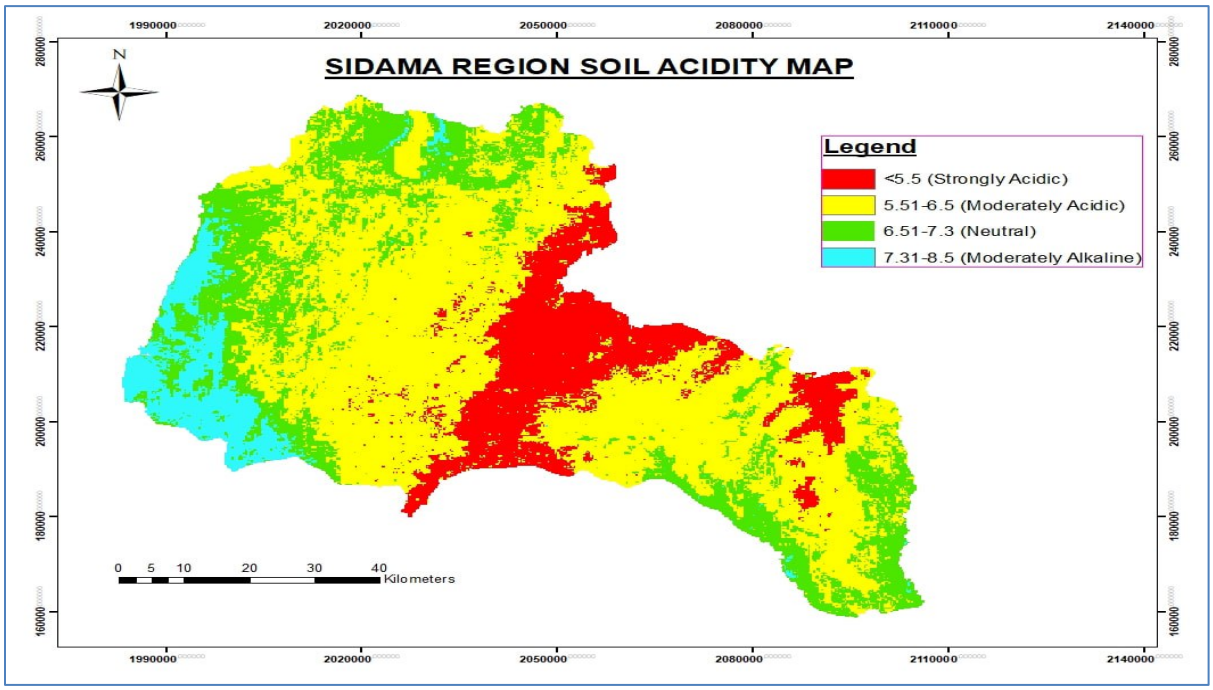

Figure 4: soil acidity map of the region

Agricultural Transformation Agency (ATA) has studied the Sidama region Soil acidity classified by four categories i.e. <5.5 strongly Acidic, 5.5-6.5 moderately Acidic, 6.5-7.3 Neutral and 7.3-8.5 moderately alkaline. As it has been seen in the map the red colour shows that, from (90,500ha-120,000ha) of soil was affected by acidity. In addition to soil acidity problem, the land was also affected by slat more than 43,400ha of land in Sidama region.

Due to soil acidity, salt and other natural and man-made factors, the land production and land productivity reduction was reduced by 50% major crops maize=30Q barely =32Q Teff= sorgum =13Q and Wheat=41Q Average productivity =26Q/ha.

2.3 Response Taken To Reverse the Land Degradation Problem in Sidama Region

- Land covered by physical and water conservation works 214,936ha
- By biological SWC 61,257ha
- By area closure 11,907ha

2.3 Key Expected Results After This Assessment Has Been Completed:

- Increase in land area under sustainable landscape management practices
- Increase in land area restored or reforested/afforested
- Increase in land area with productivity enhancing practices applied

3. Status of Forest Resource in Sidama Region

Ethiopia is a mountainous country with great geographic diversity like rugged mountains, flat-topped plateaus and deep gorges incised river valleys and rolling plains (Teweldebrhan, 1988). This makes the country one of the largest forest resources in the horn of Africa and it owns a total of 53.1 million ha covered by woody vegetation which consists of 12.5 million ha of forest land and 40.6 million ha of woodland (FAO, 2016). The total forest area of the country has declined from 15.1 million ha in 1990 to 12.5 million ha in 2015. The annual rate of forest land decline is 104, 600 ha per year that is 0.8% of forest cover of the country (FAO, 2016). According to this report in total, Ethiopia lost 18.6% of its forest cover or around 2,818,000 hectare between 1990 and 2010.

Similarly, Stern (2006) the underlying causes of deforestation and degradation based on a framework analysis were identified as population growth, insecure land tenure, and poor law enforcement. The decline of forest capacity at the global and national level is a great problem that currently affects the livelihoods of people in different ways also reported by Asfaw and Fekadu (2018).Expansion of agricultural land, logging, urbanization and infrastructure development were recorded as a major challenges and negative impact on the biodiversity and forest resources in the area.

Forest Cover Over the past 10 years, the status and trends of Ethiopia's forests have been influenced by the following factors: institutional streamlining; internal capacity-building at the federal and regional levels; high staff turnover; development and implementation of polices, programs and laws; socio-economic, bio-physical and climatic conditions; livelihood strategies

and outcomes; planned economic growth and development initiatives; and relentless deforestation and forest degradation.

Forests play an important role in environmental protection, including protection against soil erosion and sedimentation and in controlling water flow, floods and water quality. The loss of forest cover due to unplanned harvesting or land use conversion will result in serious consequences. Forests are very important in reducing surface water flow and increasing infiltration. Sidama forest estimated the total natural forest area to be 35,952 ha 5.1% of the total area of the region, woodland and shrub land cover 18800.3ha 2.6% respectively. The main threats to forests, highlighted in the 2013 report of the sector, were deforestation exacerbated by high population growth and a growing demand for crop and grazing land, forest products, particularly fuel wood, charcoal and construction wood; resettlement, and recurrent droughts because of extreme weather conditions.

In 2014 MEFCC conducted a country wide forest inventory, which also analyzed the forest cover change (based on a new forest definition) between 2000 and 2013 using a combination of ground data and remote sensing data. According to this study, the gross forest loss is approximately 92,000 ha/year and the gain 19,000 ha/year with a net deforestation of ca. 72,000ha per annum (MEFCC, 2017). This indicates the huge imbalance between the rate of deforestation and reforestation in the region.

Sidama region Finance and economy development bureau (2012) forest resource assessment based on reports and analysis of regional forest resources with its own methodology, puts Sidama region forest cover was 122,360 million ha 17.5% of the total land area. The coverage of Natural forest was 62,342 ha whereas the coverage of manmade forest was 67,268.7ha but from the total coverage of forest in the region 10 %(12961.07 ha) was degraded by different cases.

According to Regional Environment, Forest and Climate Change Commission (2014), out of the total area of the region, 23 % of the land of the region is covered with the forest resources endowment. There are different types of tree species in the forests. The highland woredas such as Hula, Bursa, Shafamo, Arbegona, some parts of Gorche, Aroresa, Burra and Daela have bamboo, hygiena, and juniper forests. Garamba Mountain which is the highest peak of theregion is characterized with semi-alpine forests. The most forests in the region are the indigenous and naturally existed. Some of the natural highland forests are Odiboko forest, Falada bamboo forest,

and Bubisa forest in AroresaWoreda. In addition, Halo Tullo natural forests in AletaChukoWoreda, Wonsho Abo forest in WonshoWoreda and Garamba bamboo natural forest in ArbegonaWoreda.

Table 3: Estimates of the current forest cover of the region

No	Forest types	Area (ha)
1	Natural forest	35,952
2	Dense forest	18,800.3
3	Plantation forest	55,957.7
4	Bamboo	11,650
	Total	**122,360**

Source :- (Sidama regional Finance & Economic Development Bureau, 2012 E.C.)

Plantation forests Plantation forests, comprised mainly of exotic tree species, include woodlots industrial and pri-urban stands used for the production of fuel wood and poles. The oldest industrial plantations were established mostly during the 1970s and 1980s and most of them are over-mature. The total area of plantation forests in Sidama region is estimated to be 55957.7 ha with an estimated potential short-term wood flow of 268,596.9 m3 per year for industrial wood consumption (World Bank 2016). Out of this, about 23% is commercial (industrial) plantation owned by the State through its regional forest and natural resources bureaus. Farmers and communities own the bulk of plantations (eucalyptus woodlots). Private woodlots are rapidly expanding and are making significant contribution to annual wood production. After natural high forests, they are the major sources of domestic wood production and supply, particularly wood used for fuel, poles, scaffolding, and furniture.

Non-timber forest products Non-timber forest products (NTFP) contribute to food security, and maintain rural livelihoods for millions of households. NTFPs, including, honey, gum and resin, spices, and forage provide huge economic benefits to a considerable number of people. Fodder from forests provides 10% and 30% of the livestock feed during wet and dry seasons, respectively. Similarly, many edible wild plants 112 serve as supplementary sources of food during times of critical food shortage (Institute of Biodiversity 2015). The NTFPs, obtained from Ethiopia's forests, include forest coffee, honey, bees wax, spices, wild food, traditional medicinal

plants, gum and incense, bamboo, fodder, firewood, charcoal, farm implements, and climbers. The production and monetary value of selected NTFPs

The Wondogenet area in Sidama Region is a place of dense forest. Knowing the immense potential of the area with trees and dense forest the Ethiopian government established the Wondogenet forestry college during the Derg regime. With the presence of many species of flora the wondogenet area host a perfume factory and a gene bank. Apart from the ecological value the forest is an ideal place to make a forest hiking and trekking. The forest also a haven for birdwatchers.

Table 4: Land Use Land Cover Map of Sidama Region

Name	Area_ha
Bush&Shurb	18268.49
Crop_Land	68540.51
Degraded_Land	19555.68
Grazing_Land	14404.34
Grass_Land	4155.04
Natural_Forest	25427.45
Plantation_Forest	432912.59
Quarry_Site	344.59
Rural_Settlement	57093.41
Urban_Settlement	18571.08
Water_bodies	10241.59
Wetland	7490.84

Source: LULC Detection Analysis, 2023

According to LULC detection, 2023 the Natural forest coverage of Sidama Region was 25,427.45 ha, plantation forest cover was 432,912.59 ha and also the coverage of bush and shrubs was 18268.49 ha.

Figure 5: A view of AbboWonshoSidama Forest (AWSF)

The Abbo-Wonsho Sacred Forest (AWSF) is believed to be a treasure house of medicinal and aromatic plants. Though most of the indigenous people are residing near the groves, they have carefully nurtured their traditional customs, rituals, ceremonies and a way of forest life through folk beliefs with great vigour (Hamer, 2002). In this regard, there is a need for Conservation of large number of medicinal plants as an important component of AWSF in Sidama

Regional State and in the country, Ethiopia, which is already documented in various studies. Thus, medicinal plant conservation is an integral part of sustainable living by these people with the nature (Bekele 2007; Belachew, M.1999; Takele, et al., 2012; Zerihun, 2014).

Figure 6:Loka Abaya National Park

Loka Abaya National Park: was degraded through both planned policy-driven actions and unplanned human activities including: expansion of agricultural activities (small-holder farming, market driven crops and livestock rearing) into forest lands, unmanaged fuel wood and construction wood collection from the forest, and growing incidence of forest fires.

3.1 Challenge/Problems of Forest degradation in Sidama Region

The main challenges or problems of forest degradation in sidama region was Loss of biodiversity, acceleration of soil erosion and flooding, decline in quality and quantity of several other ecosystem services including GHG emission are some of the consequences.

Table5: Lost medicinal plants in the region

Local name	Scientific name	Reason for decline
Dongicho	*Prunus africana*	The most over-utilized medicinally through de-barking for dealing with "hammessa", *a commonly perceived* infantile ailment
Gidincho	*Ehretia cymosa*	A native woody tree overutilized as a popular medicinal source and other livelihood pressures
Bulancho	*Withania somnifera*	A major medicinal plant, reported as over utilized
Godicho	*Fagaropsis angolensis*	Livelihood overutilization
Gatame	*Commiphora schimperi*	Livelihood overutilization
Duwancho	*Syzygium guineense*	Livelihood overutilization (esp. charcoal, construction material needs, etc.)
Ejersa	*Olea europae*	Medicinal, firewood, and construction use
Dagucho	*Podocarpus falcatus*	Declining outside of sacred sites due to overutilization
Nolle	*Achyranthes aspera*	Medicinal and livelihood overutilization

Source :(SRSOER cited from Zerihun D., 2012-2013)

Table 6: Ranking of causes of deforestation in terms of impact

Source: (Bekele et al. (2015) and MEFCC (2017))

Causes of deforestation	Level of impact
Expansion of traditional smallholder agriculture in forest areas driven by population growth of communities around forests	High
Population growth because of internal migration to forested lowland areas	High
Increased extraction of wood and other forest products following massive Population growth and the resultant demand for biomass to produce domestic energy	Medium
Forest fires related to raising livestock and making charcoal, due to poor incentives to local communities for sustainable forest use and weak forest protection.	Medium

3.2 ResponseTaken to Reverse the Forest Problem In Sidama Region

Policy and institutional development reforms, establishment of Forest and Wild animal; addressing capacity and resources limitations; creating a sustainable financing mechanism to fill

critical resource gaps and build the capacity of government and local communities to bring meaningful changes in the management of natural resources and forests in the Eco-region.

Reforestation and Limiting Forest Cover Loss

In order to recover the degraded forest the region practice afforestation and reforestation. The percentage of forest covered by afforestation was 23% or 29870.46ha, by reforestation activity 8%, by restoration 5% and also Ethiopia's national REDD+ Strategy (2016- 2030) further aims at increasing timber supply through community and private plantation 119 and promotion of area closure through the rehabilitation of degraded lands covering by vegetation (EFCCA, 2013). Participatory forest management works 450 ha (0.35%) (Arbegona 260 ha and Arooresa 190 ha).

Figure 7: Nursery site on DarraOtilcho and ArbegonaWoreda (2014)

(Source: Sidama Region SOER)

Create stakeholder awareness and community mobilization

Community awareness was developed through training and experience sharing within and outside the community those having best management practice on afforestation/reforestation. Afforestation program is not an easy task, so it needs wider stakeholder collaboration. To

mobilize stakeholders there was workshops. The workshop could also help to get missing idea for success of the program while it can help to engage stakeholders for sustainability of the task.

4. Status of Water Resource in Sidama Region

Ethiopia has abundant water resources and contains the headwaters of numerous transboundary rivers, including the Nile. Key water stress metrics suggest Ethiopia is water stressed. Total annual renewable water resources per person are 1,162 m3. The ratio of water withdrawals to supply is 32 percent, which exceeds the SDG 6.4.2ii threshold for water stress. Water stress is most evident at the sub-national level and seasonally in some locations.

Water is a basic necessity to satisfy human needs. The regional state has been striving to provide equal access to safe and affordable drinking water supply for all inhabitants. In 2013 E.C the regional pure water access coverage in urban is 58.5 %, in rural areas is 46% and the average pure water coverage is 52.25%.

The major sources of potable water supply for rural and urban community are natural Tap water, springs, Deep water burrow, hand dug wells and shallow wells. In addition to the government there are several non-Governmental Organizations working on water supply in the region.

Table 7Drinking Water Coverage

No	Woreda /Town Adminsration Name	Number Of Population			Drinking Water Supply Beneficiery			Access Coverage		
		Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
	Regional	926111	4105028	5054579		1539417	1539417	58.5	46	52.25
1	A/ Chuko-Woreda		191386	191386		65933	65933		35.5	35.5
2	A/Chuko Town	43511		43511	16151		16151	37.1		37.1
3	A/Wondo Town	56807		56807	40401		40401	71.1		71.1
4	Aleta Wondo-Wereda		206314	206314		79,990	79990		39.9	39.9
5	Arbegona-Wereda	13003	163645	176648		64,577	64577		40.9	40.9
6	Aroresa-Wereda	5743	122815	128558		48068	48068		40.9	40.9
7	Bensa-Wereda		208610	208610		78,921	78921		38.9	38.9
8	Bilate Zuria Woreda	7168	143165	150333		56,313	56313		40.9	40.9
9	Bona Zuria-Wereda	11597	169536	181133		56,978	56978		34.8	34.8
10	Boricha-Wereda	8012	126264	134276		44,450	44450		36.7	36.7
11	Burra Woreda	4442	59117	63559		17,269	17269		31.7	31.7
12	Bursa-Wereda	337756	104772	442528		36,758	36758		36.9	36.9
13	Chabe Gambeltu Woreda		83934	83934		32338	32338		40.9	40.9
14	Chire-Wereda	4544	127797	132341		50099	50099		40.9	40.9
15	Chirone Woreda		46236	46236		17,043	17043		40.9	40.9
16	Daela Woreda		45597	45597		16784	16784		40.9	40.9
17	Dale-Wereda		270279	270279		107,941	107941		40.9	40.9
18	Darara Woreda		138617	138617		50,486	50486		37.9	37.9
19	Dara-Wereda	14136	137534	151670		50,975	50975		38.6	38.6
20	Darra Otilcho	6413	118336	124749		46,246	46246		40.9	40.9
21	Daye Town	49130		49130	28420		28420	57.8		57.8
22	Gorche-Wereda	5756	137652	143408		51,088	51088		38.6	38.6
23	Hawassa Zuriya-Wereda	0	232984	232984	0	91,149	91149		40.9	40.9
24	Hawela Woreda		116492	116492		45,547	45547		40.9	40.9
25	Hokko Woreda		109015	109015		42514	42514		40.9	40.9
26	Hula-Wereda	12357	112477	124834		43,823	43823		40.9	40.9
27	Leku Town	40603		40603	23130		23130	56.9		56.9
28	Loka-Abaya Woreda	2041	123644	125685		45,433	45433		38.3	38.3
29	Malga-Wereda	7743	163446	171189		64,537	64537		40.9	40.9
30	Shafamo Woreda		67856	67856		18,814	18814		29.8	29.8
31	Shebedino-Wereda		214135	214135		80,163	80163		38.5	38.5
32	Teticha Woreda		82472	82472		28,745	28745		37	37
33	W/G Chuko Town	53534		53534	26745		26745	50		50
34	Wondo Genet-Wereda		148792	148792		55,582	55582		38.8	38.8
35	Wonsho-Woreda	3930	132109	136039		50,853	50853		40.1	40.1
36	Yirgalem Town	80300		80300	50739		50739	63.1		63.1
37	Hawassa City Admin	390569		**390569**	235638		**235638**	60.3		60.3

According to the above table from the total coverage of water in the region (52.25%) the urban centers get 58.5% of water access whereas rural areas 46% of water access. This indicates most

of the urban area prone to water shortage so they obliges to travel long distance to fetch water. Due to this reason rural women's are more vulnerable to water shortage.

Table 8: Rural Water Supply Schemes

	Woreda & Twon Admins	Hand dug wells fitted hand pump			Hand dug wells rope pump			shallow wells fitted with hand pump			/ Spring On Spot/			Line Deep Wells with distribution			Spring with distribution			/Rural Piped Schemes/			Others		
		FN	NF	Total	FN	NF	Total	FN	NF	Total	FN	NF	Total	FN	NF	Total	FN	NF	Total	FN	NF	ota	FN	NF	Total
Region		840	206	1046	688	73	761	639	156	795	4319	248	4567	137	22	159	138	10	159	87	56	143	14	8	22
1	Aleta Chuko	10	3	13	46	5	51	126	27	153	84	4	88	16	4	20	8	1	9						
2	Aleta Wondo	52	13	65	68	7	75	74	19	93	280	13	293	5	1	6	10	0	10						
3	Arbegona	69	17	86	31	4	35	14	3	17	395	21	416	2	0	2	3	0	3						
4	Aroresa	34	9	43	4	1	5	20	5	25	298	16	314	0	0	0	3	0	3						
5	Bensa	66	16	82	5	1	5	26	6	32	271	14	285	6	1	7	4	1	5	18	0	18			
6	Bilate Gangaw	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	41	55	96			
7	Bona Gangawa	46	11	57	21	2	23	18	4	22	271	14	285	4	1	5	14	2	16						
8	Boricha	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0						
9	BURRA	9	2	11	0	0	0	2	1	3	48	3	51	0	0	0	4	0	4						

Table 9: Not Accessible Pure Water and Coverage

No	Woreda/town admin	not accesses pure water	water coverage	water coverage gap
1	Alata Chuko Woreda	119,470	39%	61%
2	Alata Wondo Town Administration	25,571	61%	39%
3	Alata Wondo Woreda	87,331	60%	40%
4	Arbegona Woreda	102,557	39%	61%
5	Aroressa Woreda	77,758	38%	62%
6	Bansa Woreda	113,546	48%	52%
7	Bilate Gangawa Woreda	88,847	46%	54%
8	Bona Gangawa Woreda	102,265	41%	59%
9	Boricha Woreda	60,281	54%	46%
10	Burra Woreda	20,310	64%	36%
11	Bursa Woreda	66,349	36%	64%
12	Chabe Gambelto	53,767	38%	62%
13	Chire Woreda	74,186	44%	56%
14	Chirone Woreda	32,757	39%	61%
15	Chuko Town Administration	20,190	55%	45%
16	Daela Woreda	22,393	52%	48%
17	Dale Woreda	143,760	52%	48%
18	Dara Otilcho Woreda	49,283	57%	43%
19	Dara Woreda	72,470	49%	51%
20	Darara Woreda	83,045	38%	62%
21	Daye Town Administration	16,463	67%	33%
22	Gorche Woreda	86,187	39%	61%
23	Hawassa City Administration	113,337	76%	24%
24	Hawassa Gangawa Woreda	66,811	64%	36%
25	Hawela Woreda	63,846	45%	55%
26	Hoko Woreda	79,575	35%	65%
27	Hula Woreda	58,637	46%	54%
28	Lako Town Administration	19,945	57%	43%
29	Loka Abaya Woreda	47,612	60%	40%
30	Malga Woreda	70,329	58%	42%
31	Shabadino Woreda	191,229	35%	65%
32	Shafamo Woreda	66,423	65%	35%
33	Teticha Woreda	40,668	54%	46%
34	Wondo Genet Town Admin	23,715	59%	41%
35	Wondo Genet Woreda	73,075	51%	49%
36	Wonsho Woreda	79,622	39%	61%
37	Yirgalem TownAdministration	88,396	75%	25%
38	Total	2,445,409	51.6	49%

Table 10: Pure drinking water institutions

No	Woreda/Town Admin	Building By government Pump								Building By Non Government Pump							
		Hand pump	Rope Pump	Deep shallow	Deep	Built stream	Streams by their division	Bono	Others	Hand pump	Rope Pump	Deep shallow	Deep	Built stream	Streams by their division	Bono	Others
1	Alata Chuko Woreda	-	-	-	-	-	-	-	-	-	-	10	-	12	4	-	-
2	Alata Wondo Town Administration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Alata Wondo Woreda	-	-	-	-	-	-	-	-	-	-	10	-	16	4	-	-
4	Arbegona Woreda	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-
5	Aroressa Woreda	-	-	-	-	2	-	-	-	-	-	-	-	3	-	-	-
6	Bansa Woreda	-	-	-	-	2	-	-	-	3	-	5	-	6	5	-	-
7	Bilate Gangawa Woreda	-	-	-	-	-	1	5	-	-	-	-	-	-	-	-	-
8	Bona Gangawa Woreda	-	-	-	-				1	-	-	-	1	-	-	-	-
9	Boricha Woreda	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
10	Burra Woreda	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-
11	Bursa Woreda	-	-	-	-		-	-	-	1	-	-	-	-	-	-	-
12	Chabe Gambelto	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	Chire Woreda	-	-	-	-		1		13		-	-	-	-	-	-	-
14	Chirone Woreda	-	-	-	-	5	-	-	-	1	-	-	-	-	-	-	-
15	Chuko Town Administration	-	-	-	-		-	-	-		-	-	-	-	-	-	-
16	Daela Woreda	-	-	-	-	2	-	-	-	12	-	-	-	18	-	-	-
17	Dale Woreda	-	-	-	-	-	-	-	-	-	-	20			-	-	-
18	Dara Otilcho Woreda	-	-	-	-	-	-	-	-	-	-	-	-	21	7	-	-

Rivers and Lakes in the region

Rivers

Sidama region shares 2 major river basins from the 12 major river basins in Ethiopia. From the total area of the region 62.4% is located in Rift Valley Lakes Basin and 37.6% of its area is found in GenaleDawa river basin. Two known major rivers of the region (Logita and Galana River) join at the place called Worancha in Bona Zuriyaworeda to form Ganale River. Bo'nora River originates from Bensa highland and flows to Eastern direction around Dayye town. Onather River called Ganbelto originated from Daela, Bensa and Aroressa highlands. Both Bo'nora and Ganbelto are the tributaries of Ganale River. In addition, Hamile River flows between Chireworeda of the Sidama region and Worka and GirjaHaranfamaworedas of Oromia region. Genale River crosses the Ethiopian boundary and discharges into the Indian Ocean.

The general patterns of major river basins in Sidama National Region are determined by topographical structures which can be clarified as:

- The topography of the outward sloping of the South Eastern Plateaus and

- The structural formation of the rift valley with its in-ward-sloping escarpments

Sidama possesses two broadly classified drainage systems namely: Southeastern and Rift Valley Drainage Systems. Both systems are separated by the edge of the Rift Valley System. The most springs of the region originate from the bottom of Garamba and Galalla mountains. At the bottom of these mountains, there is plaineous topography which serves as water divide to south eastern and north western directions at SokkaSonichokebele of Gorcheworeda. The South Eastern drainage includes Goronte which is tributary of Logita River, Ererte which is tributary of Morodo River, and then Morodo River joins with Galana River around Bona Kawalanka town. The Rift valley drainage includes different rivers like Gidaawo, Koolla, Malawo, Laga-Dara, Wammole, Bilate, Boga and Kado. (Sidama Zone Statistical Abstract, 2013&14 E.C).

Lakes

Major lakes found in the region are Lake Hawassa and some part of Lake Abaya. There are different aquatic lives like fish, crocodales in Lake Abaya, hippopotamus, birds and other species in these lakes. There is also a small lake which is called Borodo in ShafamoWoreda (Sidama Zone Statistical Abstract, 2013&14 E.C).

Hot springs

The Region is on the floor of the Great Rift Valley and characterized by active and dormant volcanoes. As a result, Hawassa, Yirgalem, Wondogenet, Loka Abaya and DaraWoredas have got a number of thermal springs. There are more than 10 thermal springs in Loka Abaya woreda, around Loka Abaya national Park, 10 hot springs in Yirgalem Town Administration, 2 hot springs in DaraWoreda and 8 hot springs in Wondogenetworeda. Wondogenet, Gidabo in Yirgalem Town and Macisho Rift valley in Dara hot springs are well established hot springs in the region by their services for the foreign tourists and local communities. The other 7 hot springs in Wondogenetworeda are serving local society in Wondogenet, which is found at 20km distance from Hawassa city. From those, only one thermal spring is facilitated to service with Olympic size swimming pool and individual bath and steam rooms. Out of these, Chiqa thermal spring uses local as steam for health purposes by local community.

Table 11: Constructed Irrigations

No	Woreda/ Town Adminsration Name	Small Scale	Medium Scale	High Scale	Development of Irrigatio Institution	Total
1	BILATE ZURIA	—	1 Masifaafiya	—	—	—
2	LOKA-ABAYA	—	—	—	—	1
3	BONA ZURIA-	1	—	—	—	1
4	ARBEGONA-	1	—	—	—	1
5	BENSA	1	—	—	—	1
6	HOKKO	1	—	—	—	1
7	HAwaSa city	—	1			—
	total	4				5

Source: Sidama Zone Statistical Abstract, 2013&14 E.C

Table 12: Land Use Land Cover Map of Sidama Region

According to the LULC Detection Analysis, 2023 water bodies in the region cover 10241.59 ha whereas the coverage of wetland in the region was 7490.84 ha.

4.1 State of Water Quality in the Region

The water quality of rivers and lake in Sidama Region is remarkably getting deteriorated due to land use and land cover changes because of agricultural land expansion, an increase in investment in river and lake shore. The base flow of the rivers is getting decreased due to the increased consumption of river waters for irrigation and other purposes. Water quality assessment in few rivers showed that there was an increase in mineral content, likely because of agriculture inputs, and mining activities from river surface. Nutrient concentrations were found to be highest in crop cultivation area, while organic matter was most abundant at the river's source and mouth in the wetlands around Lake Hawassa. The highest concentrations of sediments from the cultivated as well as degraded land and fluoride were found in Lake Hawassa. Moreover, the wastewater generated from coffee processing has high concentrations of

organic pollutants like pectin, proteins and sugars (Dadi et al., 2018) has been affecting the rivers‟ water quality. Due to high pollutant content, its disposal without treatment in water bodies has become undesirable due to the danger this poses for the water bodies and to human health. Disposing untreated coffee wastewater into local water bodies polluted the downstream water sources and people residing in the vicinity of the wet coffee processing plants. This polluted water causes the people living in the downstream suffer from different types of diseases.

4.2 Challenge/Problems of water resource degradation/pollution

Though the region contains a number of perennial rivers of high surface water potential, uneven spatial and temporal distribution of the available water resources either demand huge investment to develop and extend to the water scarce areas or constrained the utility at required time and place. This is again due to the fact that most perennial springs and streams exist only in the highlands, whereas there is hardly any surface runoff and perennial springs and streams in areas below 1500 meters above sea level (ma.sl) that comprise the majority of the region. Even the groundwater which distributed in the lowlands of the region could not be appropriately developed and utilized because of financial and available technology problems. Such failures in developing and utilizing the region water resources and mismanagement to the sparsely available water have already been reflected as a root cause for overall environmental degradation.

The driving forces for the water quality degradation of the region‟s surface water resources (Rivers and Lakes) are population growth (2.9%), coffee processing wet mills, agricultural expansion, deforestation, livestock raising, mining (sand and pumice) from the lake‟s and the rivers‟ watersheds. The highlands areas of the rivers watersheds are favorable for agriculture, pastoralism and wildlife activities, whereas the mid and the lowlands areas of the rivers watersheds are favorable for coffee production which attracts an increasing number of investment and location of service providers such as Hotels and Hospitals near the lake are also causing the water quality to be degraded.In the highlands and midlands of the region, the expansion of cultivated land caused pastoralists difficulty in supporting their families and increased their vulnerability to drought and causes cattle to suffer a lot due to lack of cline water to drink. The lower water levels during dry season caused by land cover changes not only affect pastoralists but also people whose livelihoods depend on agriculture. LokaAbayWoreda is the one suffering from lack of adequate clean water resource for cattle as well as for human. Flow

regime changes cause faster surface runoff from the catchment which decelerates water infiltration into subsurface layers and decrease the groundwater recharge. As a result, soil erosion and degradation are enhanced resulting in decrease in base flow of the rivers. Nutrient concentrations in the lake exceed natural levels, and apparently lead to eutrophication. The source of this eutrophication is unfathomable, but agriculture is presumed to be the main driving force since the highest nutrient concentrations are found in the most intensive agriculture area near the lake shore. Pollution is also a growing risk in the region.

Water scarcity

Water Scarcity refers to the situation where the potable, unpolluted water is lower than the demand in the region. According to recent reports, nearly 1.2 billion people of the world lack access to clean drinking water. From this amount the majority of people found in developing countries and Ethiopia is one of the countries suffering from the water scarcity. In Sidama region various woredas like Boricha, HawassaZuriya, BilateZuriya, Darara, Lokka Abaya and Shebedino are mainly suffering from the water scarcity. Furthermore, the other remaining woredas are also encountered water scarcity partially. The livelihood of these woredas depends on the rainfall and rainfed agriculture. Water shortages in the region are causing a variety of illnesses which can range from food poisoning to cholera. Typically, water scarcity in the region is driven by two important factors such as the increasing use of freshwater due to high population growth and depletion of usable freshwater resources. Furthermore, the scarcity can be of two types which are physical water scarcity and economic water scarcity. Physical water scarcity is caused when a natural water resource is unable to meet the demands of a particular region where the physical lack of water available to satisfy demand exist. Economic water scarcity is caused by the mismanagement of sufficiently available water resource where the lack of infrastructure development that controls storage, distribution and access exist.

Figure 8: Group of peoples waiting to fetch water in BilateZuriyaworeda

(Source: SOE of SNRS)

Pollution by Coffee Processing Wet Mills

The coffee processing wet mills are another driving force for rivers‟ water pollution in Sidama Region. There are about 383 functional coffee processing wet mills in Sidama Region. All wet coffee processing plants in Sidama Region are constructed close to rivers and streams. This is because a lot of water is needed for washing the beans, removing the pulp and the mucilage. The coffee processing wet mills use the water bodies for direct disposal of the wastewater released from the wet coffee processing plants. While there are some wet coffee processing plants that use disposal pits to stabilize the generated wastewater, these disposal pits are constructed without following the correct design and dimensions. In addition, they lack the proper linings to protect against leakage of the effluents into the underground water and the holding capacity of the disposal pits is not taken into consideration during construction. Thus, the coffee processing water and its wastewater are routinely discharged into nearby streams and rivers. This practice in coffee production involves hand-picking of ripe coffee cherries, followed within a few hours by manual selection to eliminate defects and mechanical pulp removal. After the skin and pulp of the ripe coffee cherry are eliminated by pulp removal process, the coffee beans retain a sticky, firmly attached mucilage layer that must be removed prior to drying and storage. The mucilage-coated beans are generally placed in an open tank, where natural fermentation is allowed to

proceed for 10-48 hours. At some point the fermentation process has loosened the mucilage from the bean surface, such that it can then be washed away with water. The clean beans are moved to a patio on the farm, where they are sun-dried to approximately 40% water content. In most cases, they are then sacked and quickly transported to hotter and drier locations. After further sun-drying to approximately 12% water content, the beans are sufficiently stable for storage prior to export as green coffee. The process described above includes discharge of large amounts of wastewater resulting from the various processing steps: sorting of cherries by flotation, pulp removal, and washing of the beans after fermentation is complete. Overall, this water is acidic, deoxygenated, and laden with suspended solids and organic material from the pulp and mucilage. In all wet mills the wastewater is simply stored in large ponds and then discharged into the nearest stream or river. Almost all the rivers in coffee producing livelihood belt of Sidama Region are being polluted by the effluent from the coffee processing wet mills. To give an example; as the report (December 2021) of TechnoServe Ethiopia (Non-governmental Organization) depicted that there are about 87 wet mills along the kola rivers, as well as other neighboring rivers including the Malawo, Jigesa, Raro, Bisandima, and Chico rivers in AletaWondo woreda. These wet mills are even the one got support from the organization.

Techno Serve Ethiopia depicted that approximately 600 million liters of effluent were discharged into the rivers of the Sidama region as a result of poor waste water management and overconsumption of water during the coffee processing season. This polluted water is then used as source water for communities and wet mills downstream. This problem is becoming so acute that 103 legislation was introduced to prevent wet mills from being constructed within five kilometers of one another in an effort to limit the production of waste water.

Figure 9: polluted water by Coffee processing wet-mill (Techno Serve Ethiopia)

Source: SOE of SNRS

Industries and Factories effluent

Various industries and factories found in the region are major cause for water pollution. In Hawassa city the effluent from industrial parks, the effluent from Etab Soap industry, effluent from Brewery factory, effluent from Pepsi factory and other factories are the sources for the deterioration of Hawassa Lake water quality. However, the amount and the type of effluent were not studied yet and we didn't find the data to quantify the amount of the effluent from these industries and factories.

Figure 10: Liquid waste from Yirgalem

(source: SOE in SNRS)

4.3 Response to Water Pollution

The region is working with international NGOs to reduce the rivers water pollution of the rivers. The TechnoServe Ethiopia has been started working with the region to support wet mills to implement innovative waste management solutions to prevent both wastewater and coffee pulp from being released in the rivers. After its three-phase program in which the project supported 87 wet mills along the kola rivers, as well as other neighboring rivers including the Malewo, Jigesa, Raro, Bisandima, and Chico rivers. TechnoServe continued to work a three-year period (2019-2021) to improve wastewater treatment at an additional 20 wet mills in Dale and ShebedinoWoredas of Sidama region through the installation of pulp separation and Vetiver grass wetlands to treat and filter wastewater. Consequently, 11 new wetlands were established in 2019, and an additional 11 wetlands in 2020. The project provided technical support and management to make the wetlands fully functional.

5. Status of Minerals in Sidama Region

Natural resources are resource that found in nature without human intervention and valuables to humans and other life forms. Natural resources are soil and minerals, surface water and groundwater, forest, energy resources such as petroleum, natural gas and geothermal energy etc…

Natural resources are not evenly distributed throughout the world, therefore this study focus on the natural resource that found Sidama regional state of Ethiopia. It is located in the south eastern part of Ethiopia and border with Oromia Region in the North, North- East and South East, Gedeo zone in the South and Wolaita Zone in the West of SNNPRS.

Mineral, naturally occurring homogeneous solid with a definite chemical composition and a highly ordered atomic arrangement; it is usually formed by inorganic processes(Klein, 2023).

Geological surveys conducted on minerals in Ethiopia, have shown formations that are believed to contain a vast amount of mineral resources, with proven deposits of industrial minerals, coal, precious metals and metals. Sidama region is one of gifted with abundant natural resource. Mineral is one of the natural gifted resources in Sidama Region.

Figure 11: Minerals that found in Sidama region

Based on the information of Sidama water and mining energy office mineral were classified in to three, those are precious, industrial and construction minerals. The precious mineral that found in Sidama regions is Gold which, is found in Bansa, Cabbe, Bona Zuria and HookoWoredas .

Table 13 Precious Mineral location in Sidama Region

Type of Mineral	Location	
➢ Precious	Woreda	Vellage/Kebelle
Gold	Bansa	Huluka and Okote/Asserti
	Cabbe	Bubisa and Osolle
	Bona Zuria	Abayekararo and Lagalola
	Hooko	Sadeka, Marmara and Lagalola

These precious Minerals gold has been mined traditionally (artisinaly) by near by the society and by Artisanal Miners association is not well mechanized.

Figure 12 Traditional way of Gold extracted in HulukaKebele

The second type of mineral is industrial minerals most of the industrial mineral are located where Precious mineral were located. The industrial mineral were found in the Sidama regions are Kurtize, Feldspure, Kaolin, Talke, Graniet, Lithium and Hapatene.

Table 14Industrial Mineral location in Sidama Region

Type of Mineral	Location
➢ Industrial Minerals	Woreda
Kurtize	Bansa
Feldspure,	Cabbe
Kaolin,	Arorresa
Talke,	Hooko
Graniet	
Lithium	
Hapatene.	Bona zuria

The third type of mineral which is found in Sidama region is Construction Minerals which is found all over Sidama Region in any place.

Stone, Sand, Gravile, Select materials, Demention stone, Redash, Basalt, Raollight ,Ignimbright and Pomis

Table 15: Mineral extracted in Sidama region in 2013

No	Woreda/Town Admin.	Constructions minerals/M3				Industrial minerals	Precious and semi-precious mineralsin /Kg/
		stone	Sand	Grave	Others	Talke tone	Gold
1	AlataChukoWoreda	195000					
2	AlataWondoWoreda	-	-	1600	-	-	-
3	BansaWoreda	3450	-	-	-	-	-
4	BilateGangawaWoreda	-	16051	-	-	-	-
5	Bona GangawaWoreda	5871	3254	1781	-	-	-
6	ChabeGambelto	-	-	-	-	-	11
7	DaelaWoreda	185210	46400				
8	Dale Woreda	-	-	-	-	-	-

9	DaraOtilchoWoreda	9600	-	-	-	-	-
10	DaraWoreda	73600	20400	4600	-	-	
11	HawassaGangawaWoreda	19750	186386	7533	-	-	
12	HawelaWoreda	-	-	-	-	900	-
13	Hoko Woreda	-	-	-	-	-	1
14	Loka Abaya Woreda	61000	49100	-	-	-	-
15	MalgaWoreda	2000	-	-	-	-	-
16	ShabadinoWoreda	8132	-	-	43390	-	-
	Total	563613	114805	210167	55523	900	12

Table 16: Number enterprise that got licence in

No.	Woreda/Town Admin	No. of Enterprise to get building minerals licence
1	AlataChukoWoreda	2
2	AlataWondoWoreda	6
3	AroressaWoreda	1
4	BansaWoreda	9
5	BilateGangawaWoreda	21
6	Bona GangawaWoreda	7
7	BurraWoreda	1
8	ChironeWoreda	1
9	DaelaWoreda	2
10	Dale Woreda	4
11	DaraOtilchoWoreda	4
12	DaraWoreda	57
13	DararaWoreda	3
14	Hawassa City Administration	3
15	HawassaGangawaWoreda	6

16	MalgaWoreda	7
17	ShabadinoWoreda	9
18	Sidama Region	145

5.1 Challenges of mineral resources in Sidama Region

Mining in Sidama region is currently predominantly controlled by low skilled, small scale miners utilizing low Technology machineries and inputs. As described by mining and energy office the main challenges in mineral resources are

- Illegal mining
- Lack of technology like modern machinery
- Lack of capital
- Environmental degradation

5.2 Response taken to Challenges of mineral resources in Sidama Region

To address the environmental degradation caused by mining minerals for various enterprises, an environmental impact assessment was conducted.

Restoring the mine site topography; conserving and replacing topsoil early; and using passive and active restoration measures to recreate functioning grassland, forest, and wetland ecosystems that are well established.

6. Recommendation

During filed visit, we have seen 6 main sites in the region, namely, farm investment, communal grazing land, quarry site and gold potential area, protected natural and plantation forest and Loka Abaya National Park respectively. Based on the above list of visited themes, the following technical recommendations were suggested.

- In and Around Loka Abaya National Park, the area is highly exposed to land degradation and expose to rocky surface, so it needs to recover the land by avoid interference from crop cultivation practice.
- The exploitation of Gold and other minerals should be produced in skilled labor and modern technology.

- The regional government of investment office properly handled the numbers of investors and their investment land to create an employment opportunities.
- The implementation of soil conservation measures has to start from the upper part of the watershed.
- Fertile soil on cultivated land needs to be protected from water erosion by improving the water harvesting system.
- Edges of degraded areas and communal grazing land should be protected from further degradation and the livestock must be kept out of the whole area.
- Reduced the effects of quarry site on wetlands and water resources by properly planned and create a buffer zone between them.
- Manage the free communal grazing system in low land parts of Sidama region around Loka Abaya National Park.
- The mining sector of the region must be avoiding illegal mining system, environmental degradation by reducing the challenges of lack of technology and capital.

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Sidama Region Statistical Abstract of 2013 E.C and 2014 E.C

Sidama Region SOER, 2022

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