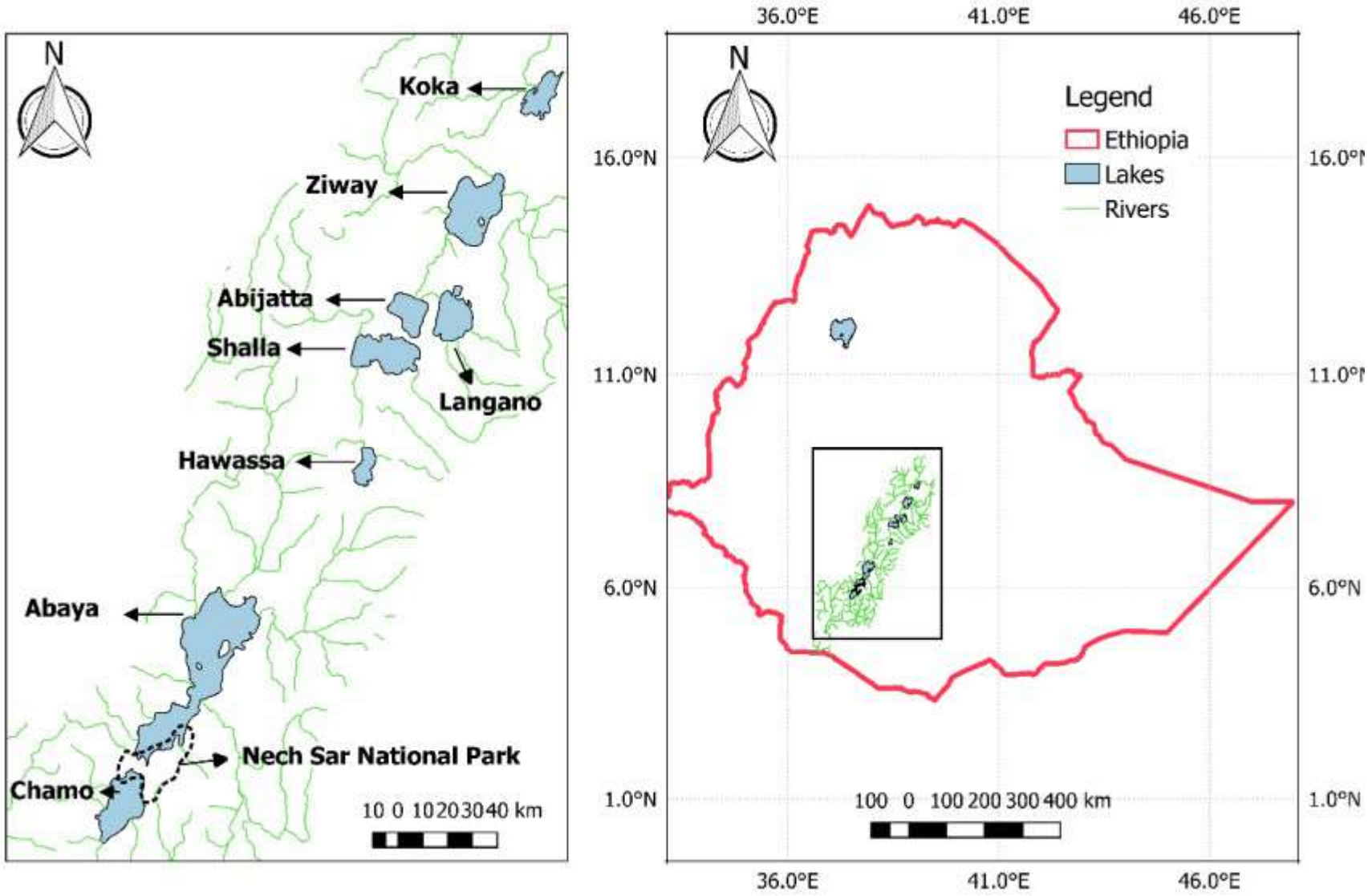
A joint project to establish lake research stations that supports management and conservation plan of Abaya and Chamo Lakes

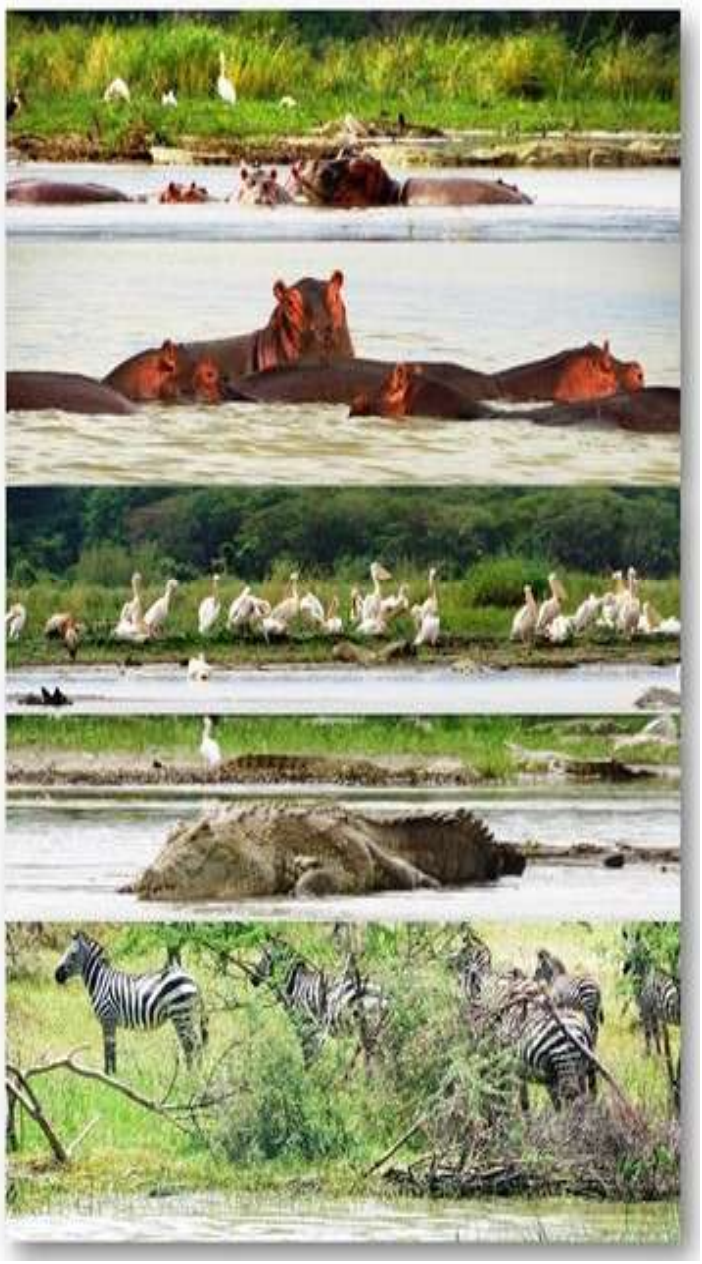
Cooperation among
Arba Minch University, KU Leuven-AMU-IUC, Nech Sar National Park, GIZ-BFP-IWP, Gamo Gofa Zone EPFO, Arba Minch Zuriya Woreda, and Bonke Woreda

Project Leader - Dr Fassil Eshetu Teffera (aquatic ecology) Email: fassil.teffera@yahoo.com
Co - investigator - Dr Genaye Tsegaye (Natural Resource Management)
Email genaye.tsegaye@gmail.com

Location


N
Koka
Ziway
Abijatta
Shalla
Langano
Hawassa
Abaya
Nech Sar National Park
Chamo
10 0 10 20 30 40 km
36.0°E
41.0°E
46.0°E
16.0°N
11.0°N
6.0°N
1.0°N
Legend
Ethiopia
Lakes
Rivers
100 0 100 200 300 400 km

Background



The two largest Ethiopian Rift Valley lakes provide important ecosystem services, in particular

- *fisheries,*
- *water supply,*
- *groundwater recharge,*
- *wildlife habitat,*
- *recreation,*
- *microclimate stabilization and climate regulation.*
- Have a positive impact on **modulating** the weather and air quality of Arba Minch town

- Without Lake Chamo and Lake Abaya the average temperature in Arba Minch city and the lower catchment areas would increase immensely, which would create **unlivable conditions for the population**

- Despite the prominent role in the maintenance of biological diversity and economic sustainability, very little has and is being done to protect this iconic lakes

Abaya basin-Belate Watershed severe erosion and farming without soil and water conservation

Extreme erosion in Belate basin

- **The entire basin is severely threatened by land degradation**
- **Top soil removal is exposing soft bedrock consisting of red subsoil, volcanic ashes and pumices**

Chamo basin-Elgo Watershed steep slope farming without soil and water conservation

Chamo basin- Elgo Watershed farming at river bank without soil and water conservation

Sediment load

The effect of Sile flooding on Chamo Lake 2011

Habitat change_ Crocodile market to the place Gangulie

Habitat change_ Crocodile market to Gangulie

- Currently, large parts of Lake Chamo have no official management and conservation plan to protect the lake.
- If no measures are taken to control erosion, it is expected that the Lake Chamo will undergo a change to turbid state similar to the change Lake Abaya experienced several decades ago.
- Hence, the unique and socio-ecologically important Lake Chamo will become history.

Approach

In order to answer the Call to Action!

A cooperation among

- Arba Minch University & KU Leuven AMU-IUC,
- Nech Sar National Park,
- GIZ-BFP-IWP,
- Gamo Gofa Zone Environmental Protection & Forest Office and Arba Minch Zuriya Woreda and Bonke Woreda was established on 2018.

Approach

In a first phase

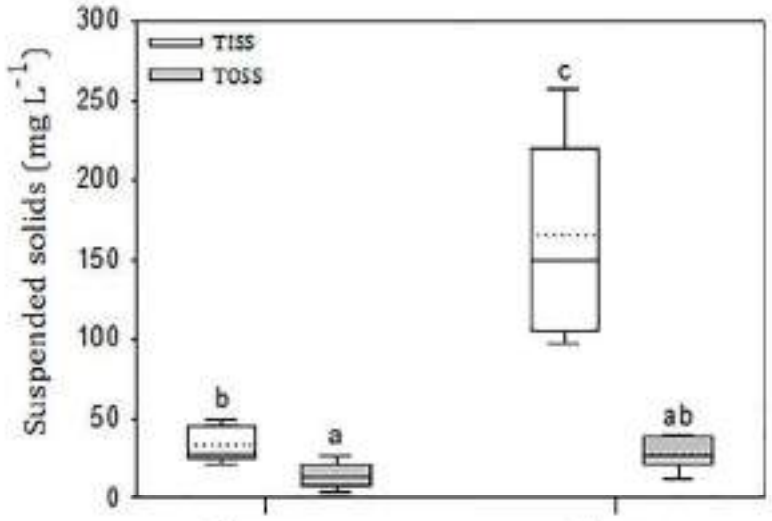
- The prefeasibility study on the catchments of both lakes conducted and provided the following information:

  - The background history of Lake Abaya and Chamo;
  - Literature review (from grey to up to date);
  - Map of the entire catchments of the two lakes;
  - Slope; annual rainfall; the rough occupation of the soils; recent vegetation cover (and change, development) and the status of **sediment deposition** at the inflow of the two lakes

(1) the background history of Lake Abaya and Chamo;

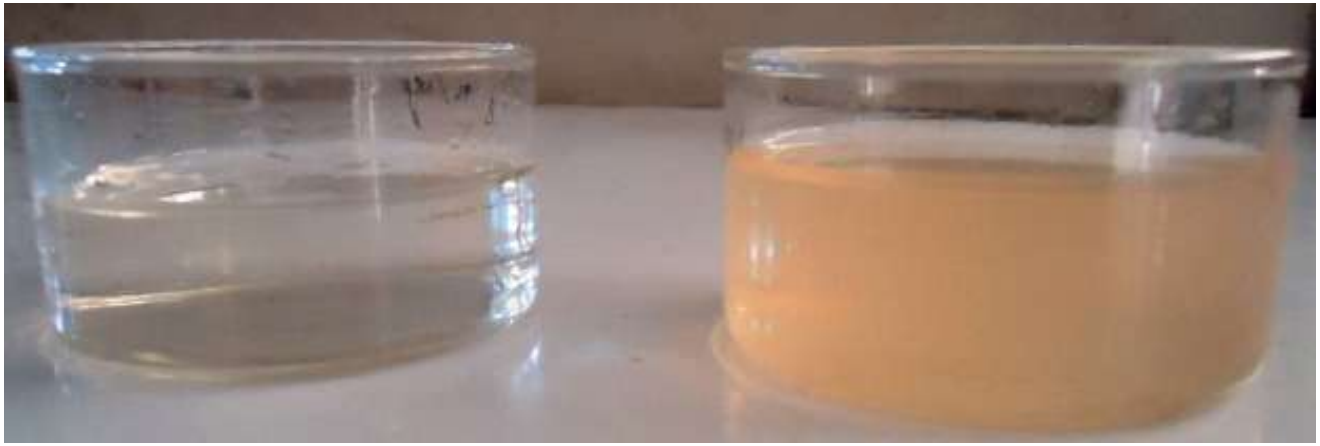
120 years ago the Abaya and Chamo Lakes shore hosted several wildlife (including Elephant, Giraffe, Lion and wilddog), especially the outflow of Lake Abaya to River Kulfo (see figure below) was named Elephant peninsula by Bottego (1896) for the very many elephants present. Currently the aforementioned wildlife became history.

Sediment load



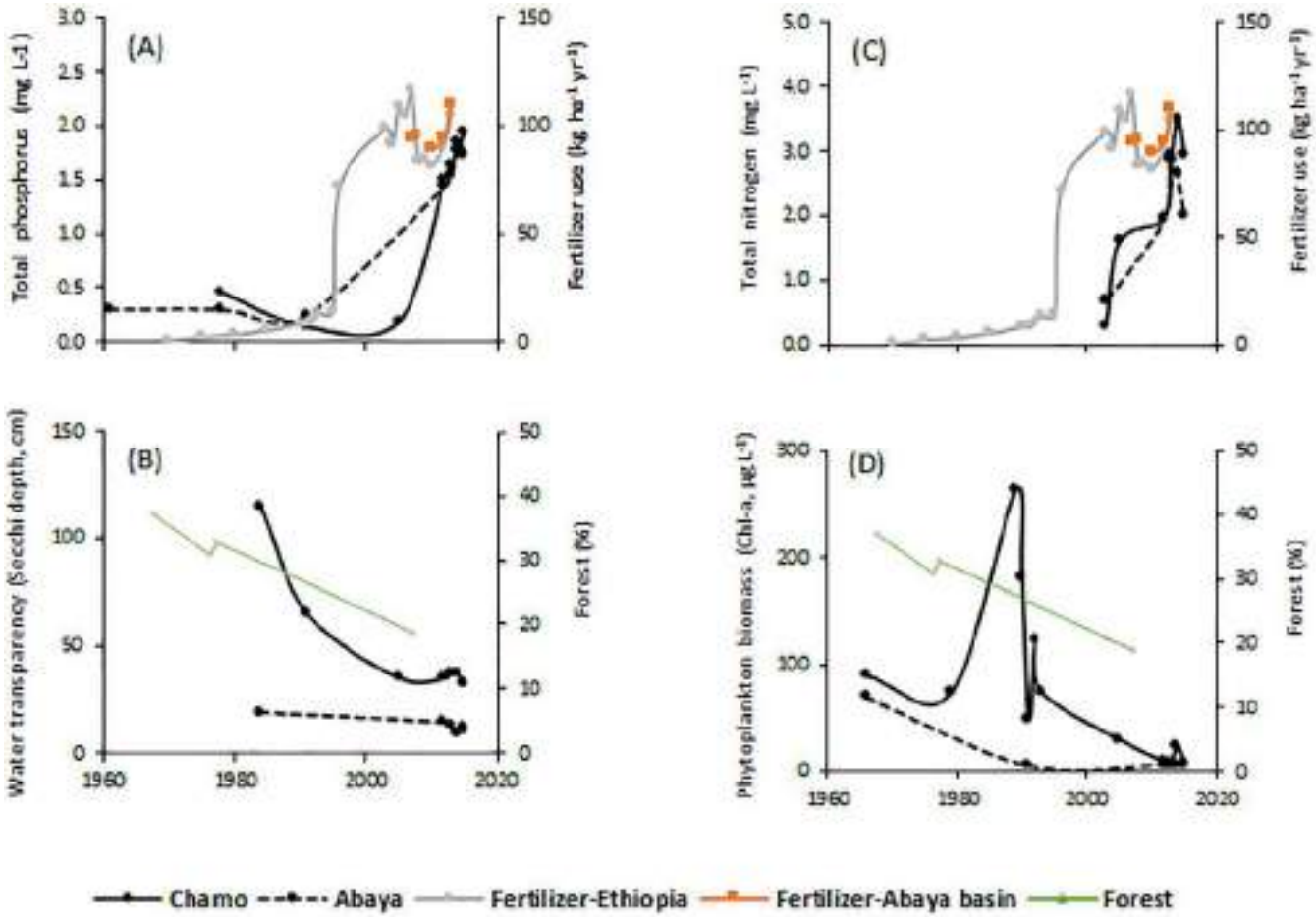
In Lake Abaya, 85% of suspended solids is inorganic in nature, whereas that percentage is 70% in Lake Chamo

The most recent clayey, unconsolidated sediments on top of the consolidated strata as are due to soil erosion processes



Chamo at Kulfo River entrance

Longer-term changes- terrestrial impacts



TP ↑5 times in 54 yrs
TN ↑7 times in 10 yrs

Fertilizer ↑ over time 1970's & 1980's < 21 kg/ha. However, SG2000 b/n 1993 & 2013 ↑13-105

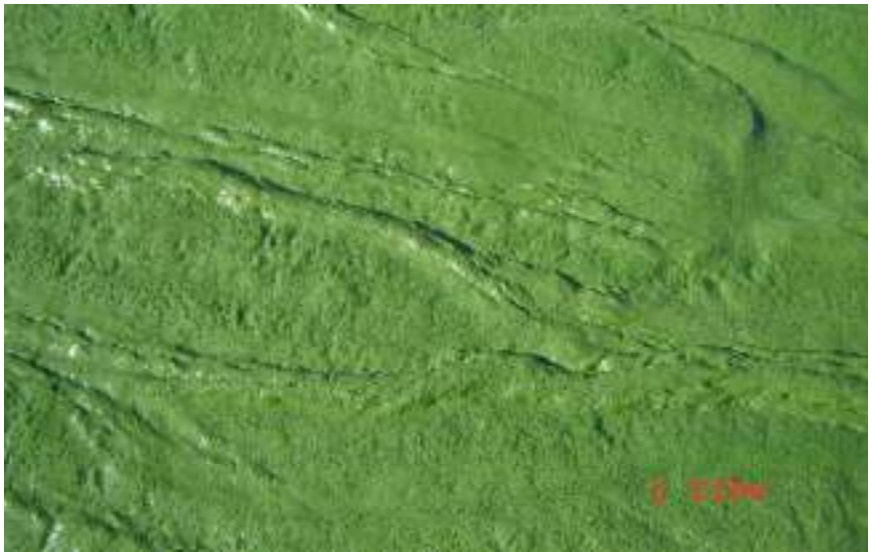
Strong ↑ in nutrient follows with 9y delay, the ↑ fertilizer.

In 30 y Sec Chamo↓115-32cm. In Abaya 19 to 11 cm

AB Chl-a ↓ 40 yr,

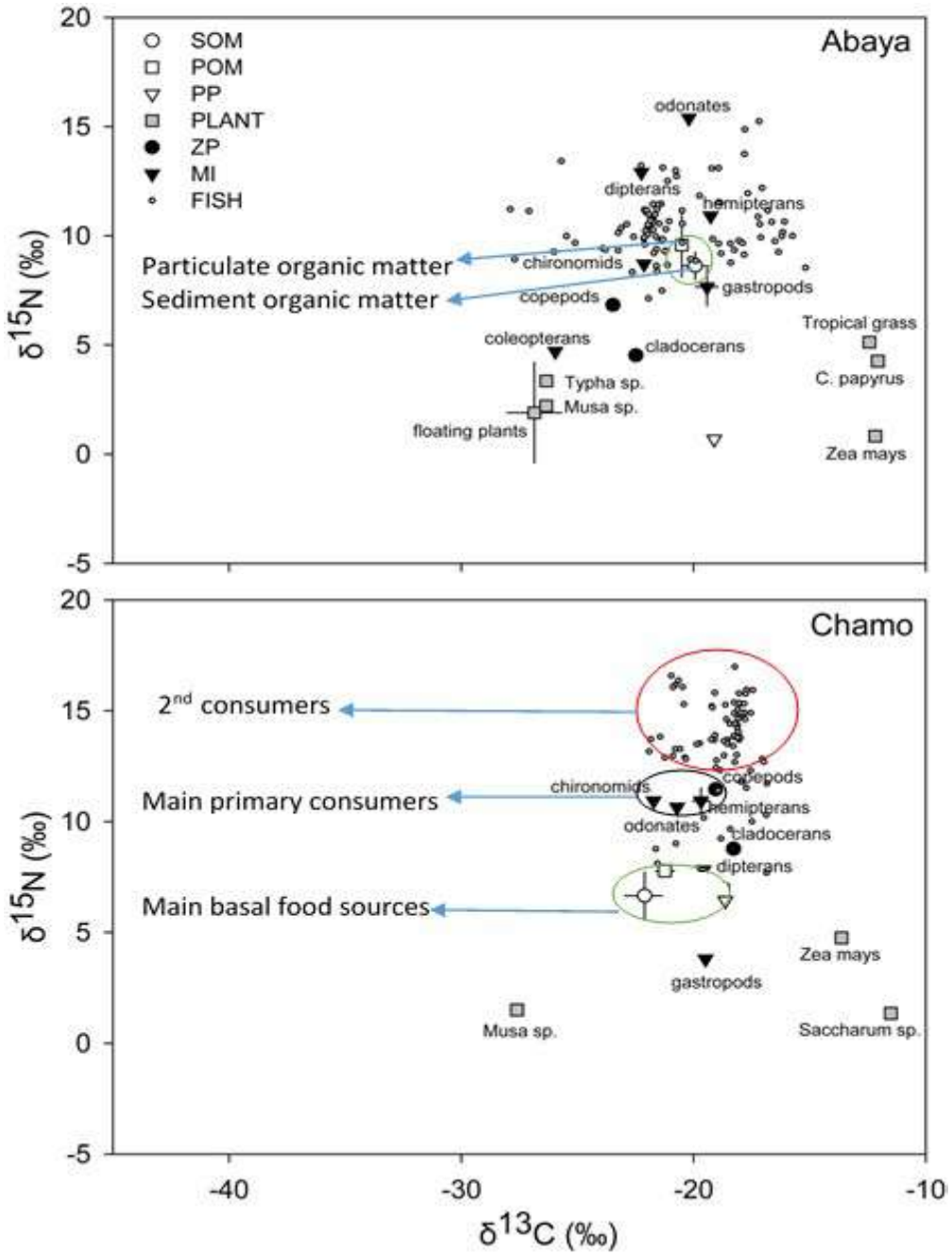
Chl-a in Chamo dramatically ↑ 1970s & 1980s, but ↓ 1990s
Likely due light limitation

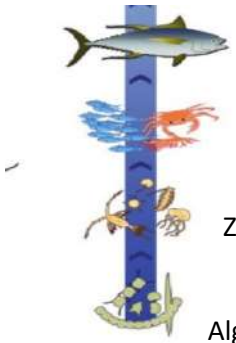
Algal Bloom and fish kill



Source: Dr.Alemayehu H/Michael

Abaya and Chamo food chain





Fish

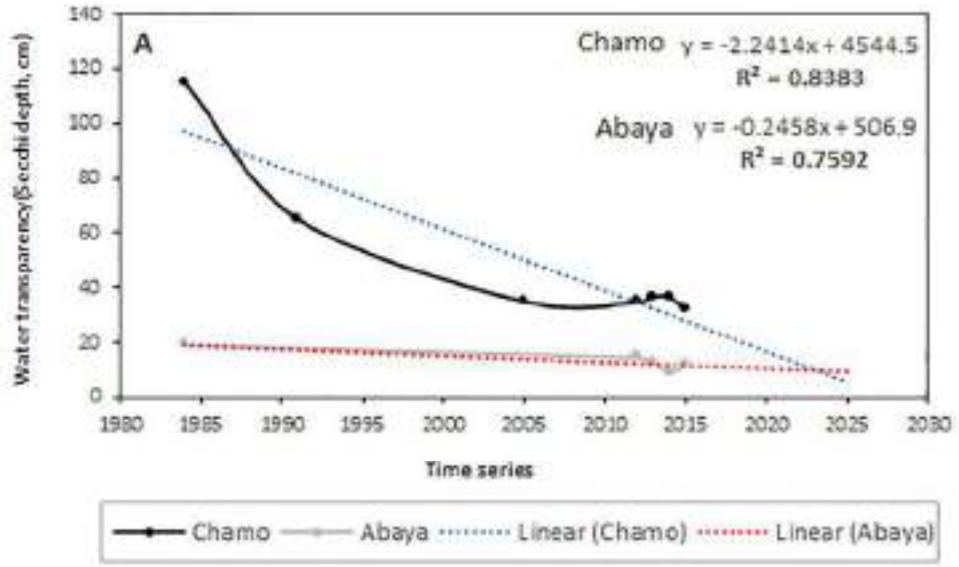
Macroinvertebrate

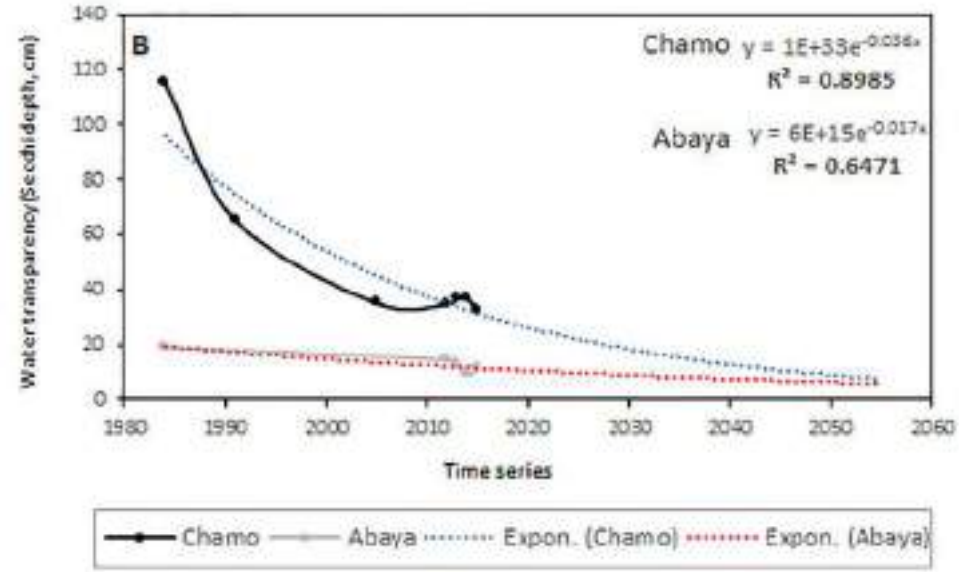
Zooplankton

Algae

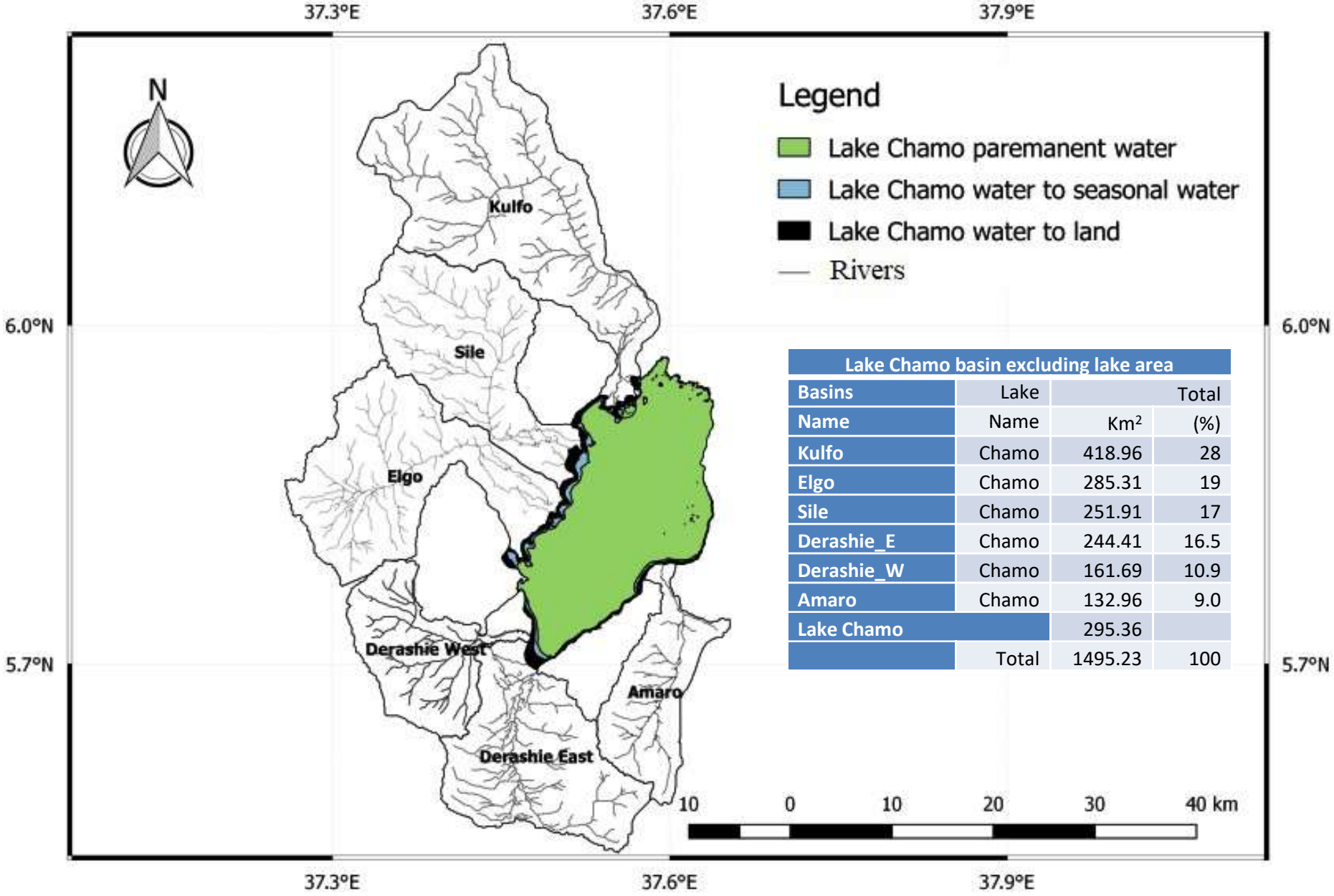
Sediment OM

What are the projections for the future?



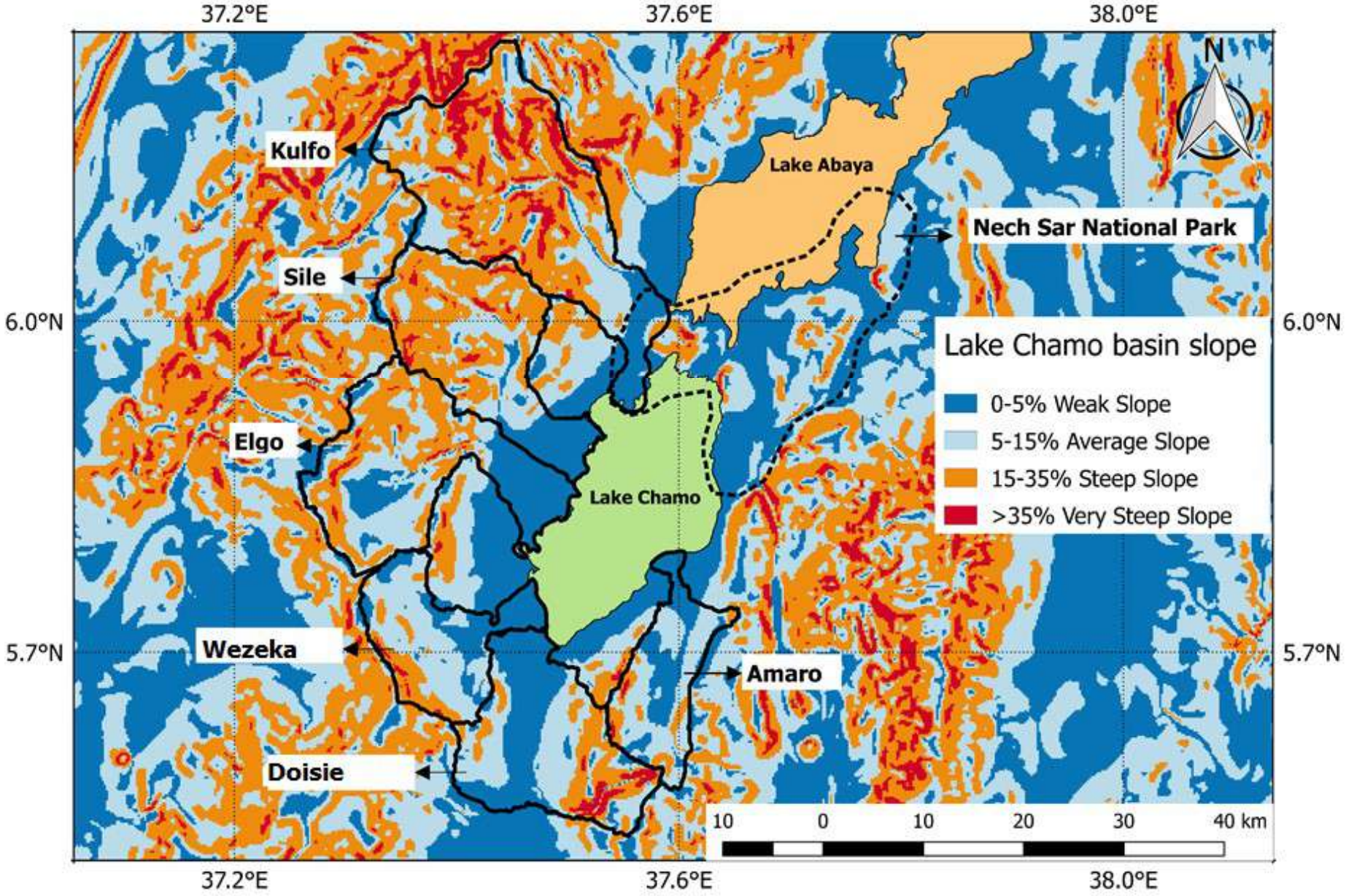


Lake Chamo Catchment Characteristics

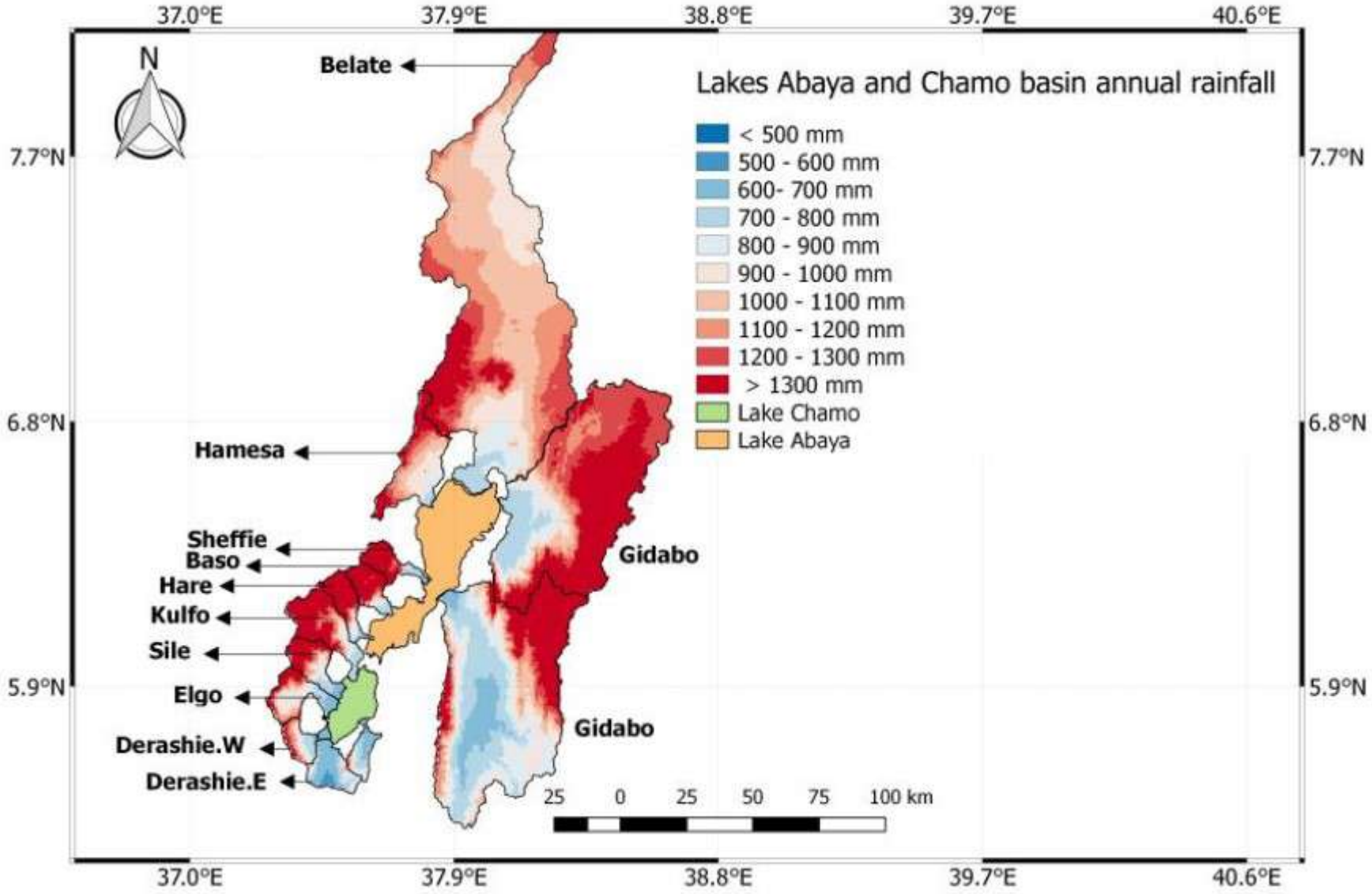


Lake Chamo basin excluding lake area			
Basins	Lake		Total
Name	Name	Km^2	(%)
Kulfo	Chamo	418.96	28
Elgo	Chamo	285.31	19
Sile	Chamo	251.91	17
Derashie_E	Chamo	244.41	16.5
Derashie_W	Chamo	161.69	10.9
Amaro	Chamo	132.96	9.0
Lake Chamo		295.36	
	Total	1495.23	100

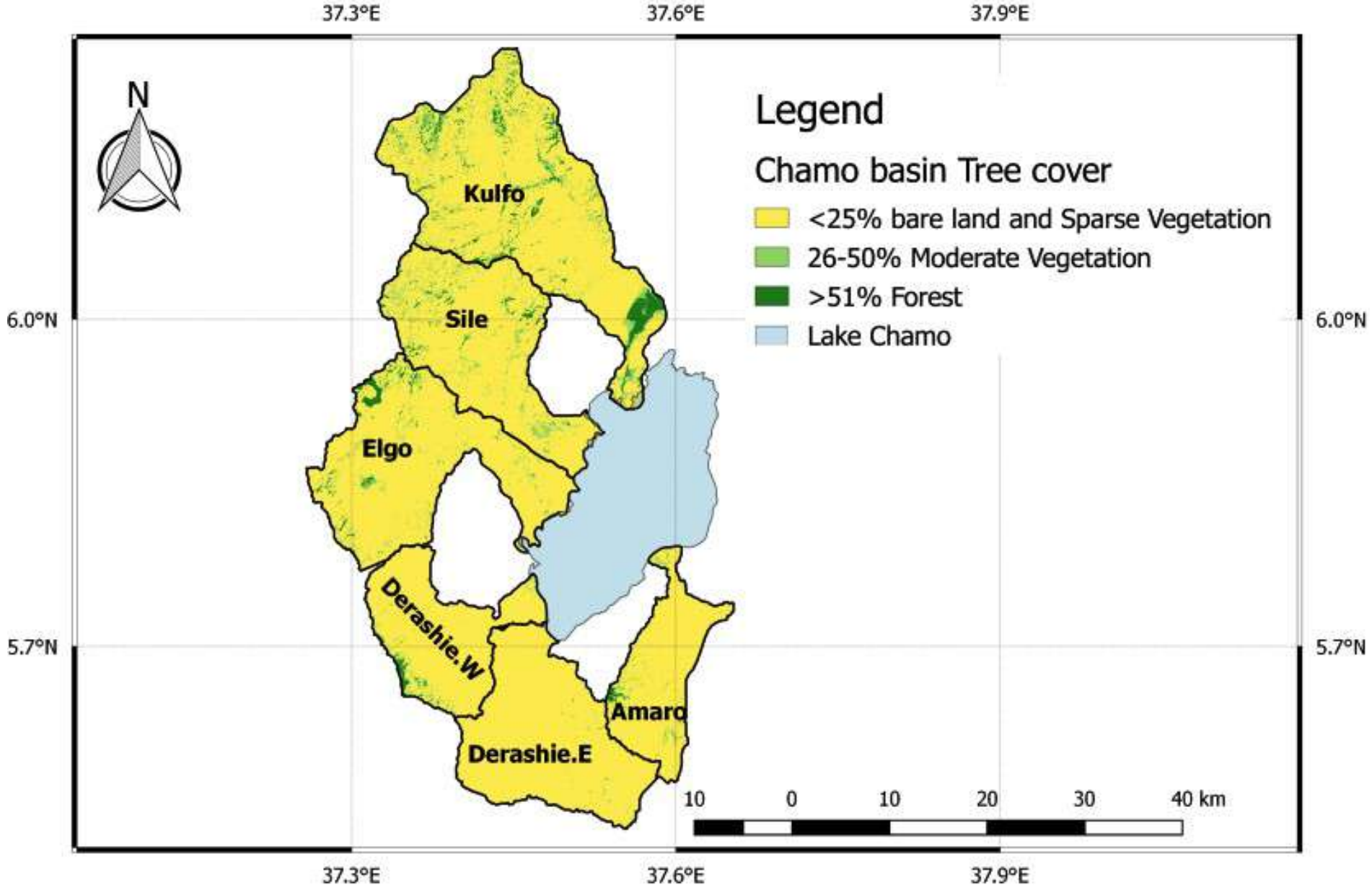
Slope


37.2°E
37.6°E
38.0°E
6.0°N
5.7°N
N
Kulfo
Sile
Elgo
Wezeka
Doisie
Amaro
Lake Abaya
Nech Sar National Park
Lake Chamo
Lake Chamo basin slope
0-5% Weak Slope
5-15% Average Slope
15-35% Steep Slope
>35% Very Steep Slope
10 0 10 20 30 40 km

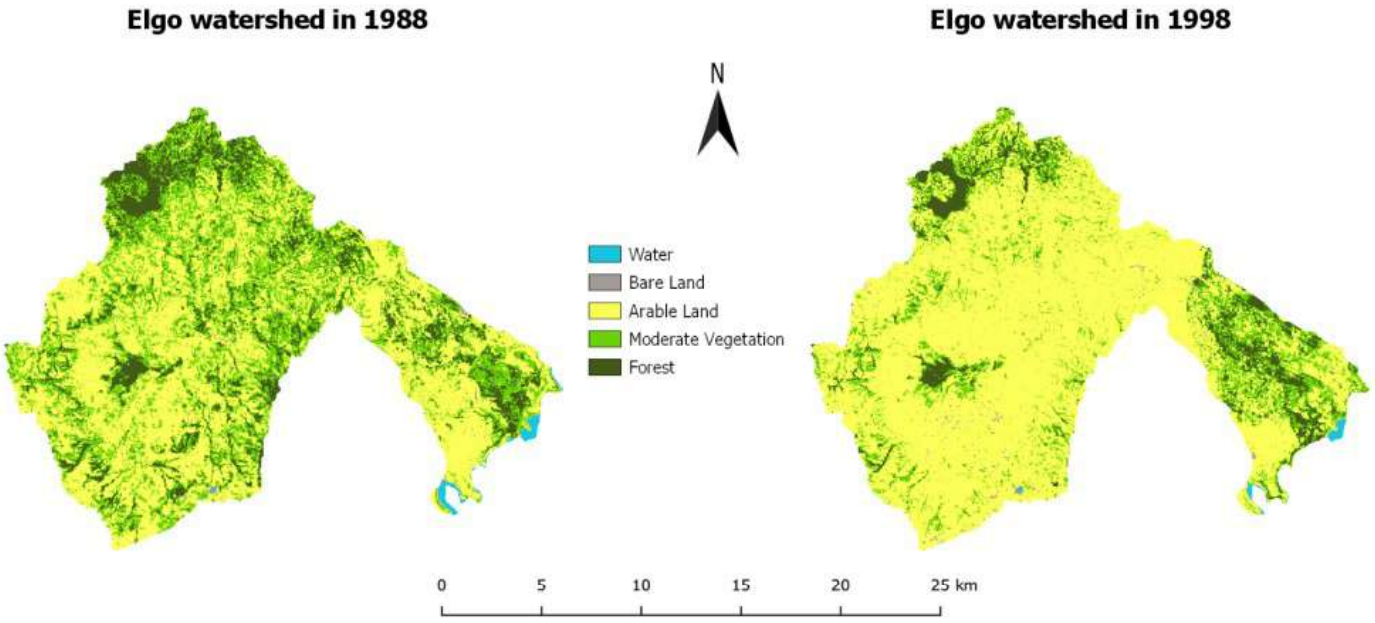
Rainfall


37.0°E
37.9°E
38.8°E
39.7°E
40.6°E
7.7°N
6.8°N
5.9°N
N
Belate
Hamesa
Sheffie
Baso
Hare
Kulfo
Sile
Elgo
Derashie.W
Derashie.E
Gidabo
Gidabo
Lakes Abaya and Chamo basin annual rainfall
< 500 mm
500 - 600 mm
600- 700 mm
700 - 800 mm
800 - 900 mm
900 - 1000 mm
1000 - 1100 mm
1100 - 1200 mm
1200 - 1300 mm
> 1300 mm
Lake Chamo
Lake Abaya
25 0 25 50 75 100 km

Vegetation cover



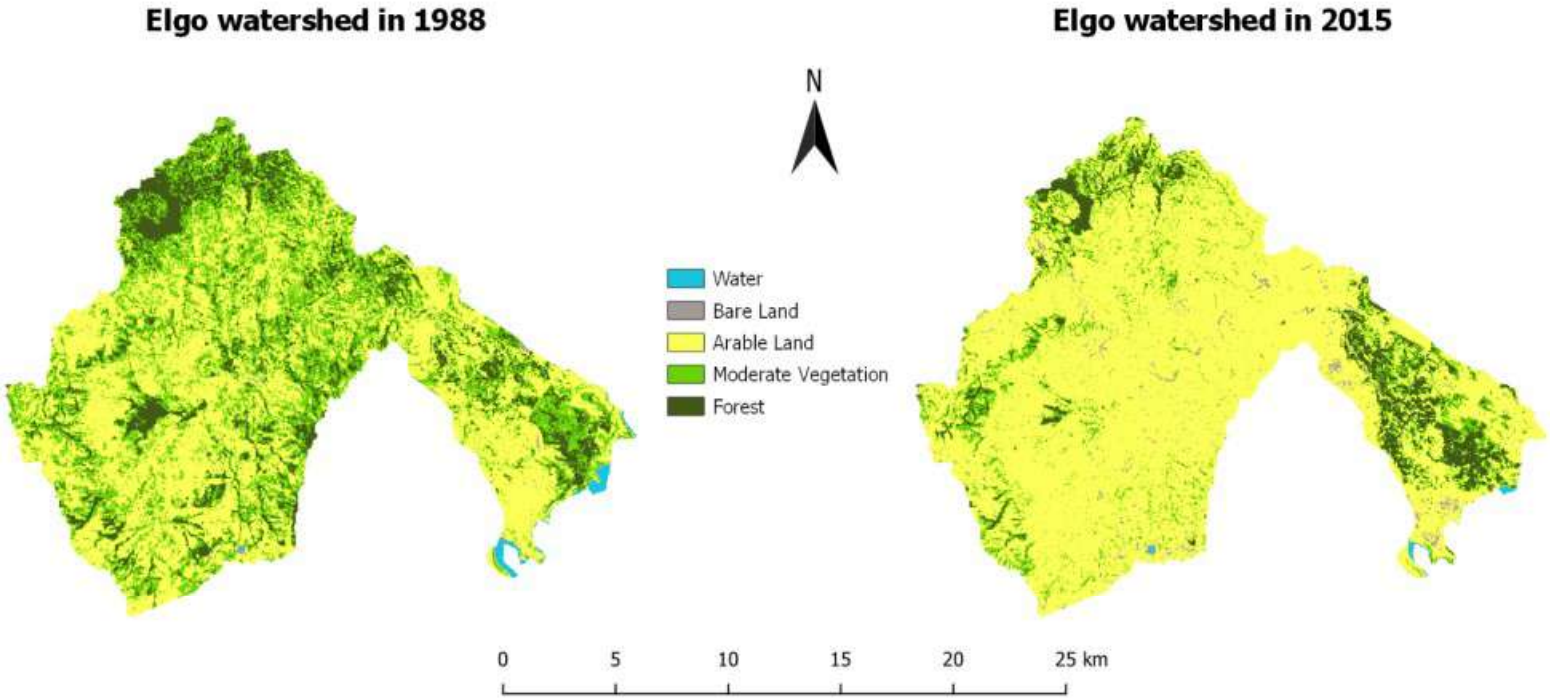
Land Use change 1988-1998 G.C



Vegetation Cover	Gain (ha)	Loss (ha)	Persistence (ha)	Persistence (%)	Net change (ha)
Water	0.90	93.42	78.48	45.65	-92.52
Bare Land	164.43	62.46	27.72	30.74	101.97
Arable Land	8773.83	1689.57	12742.20	88.29	7084.26
Moderate Vegetation	2543.40	7498.44	2085.30	21.76	-4955.04
Forest	888.57	3027.24	1234.08	28.96	-2138.67

	1988		1998		
Vegetation Cover	Area (ha)	Area (%)	Area (ha)	Area (%)	Net change (%)
Water	171.90	0.60	79.38	0.28	-53.82
Bare Land	90.18	0.32	192.15	0.67	113.07
Arable Land	14431.77	50.57	21516.03	75.39	49.09
Moderate Vegetation	9583.74	33.58	4628.70	16.22	-51.70
Forest	4261.32	14.93	2122.65	7.44	-50.19
Total	28538.91	100.00	28538.91	100.00	

Land Use change 1988-2015 G.C

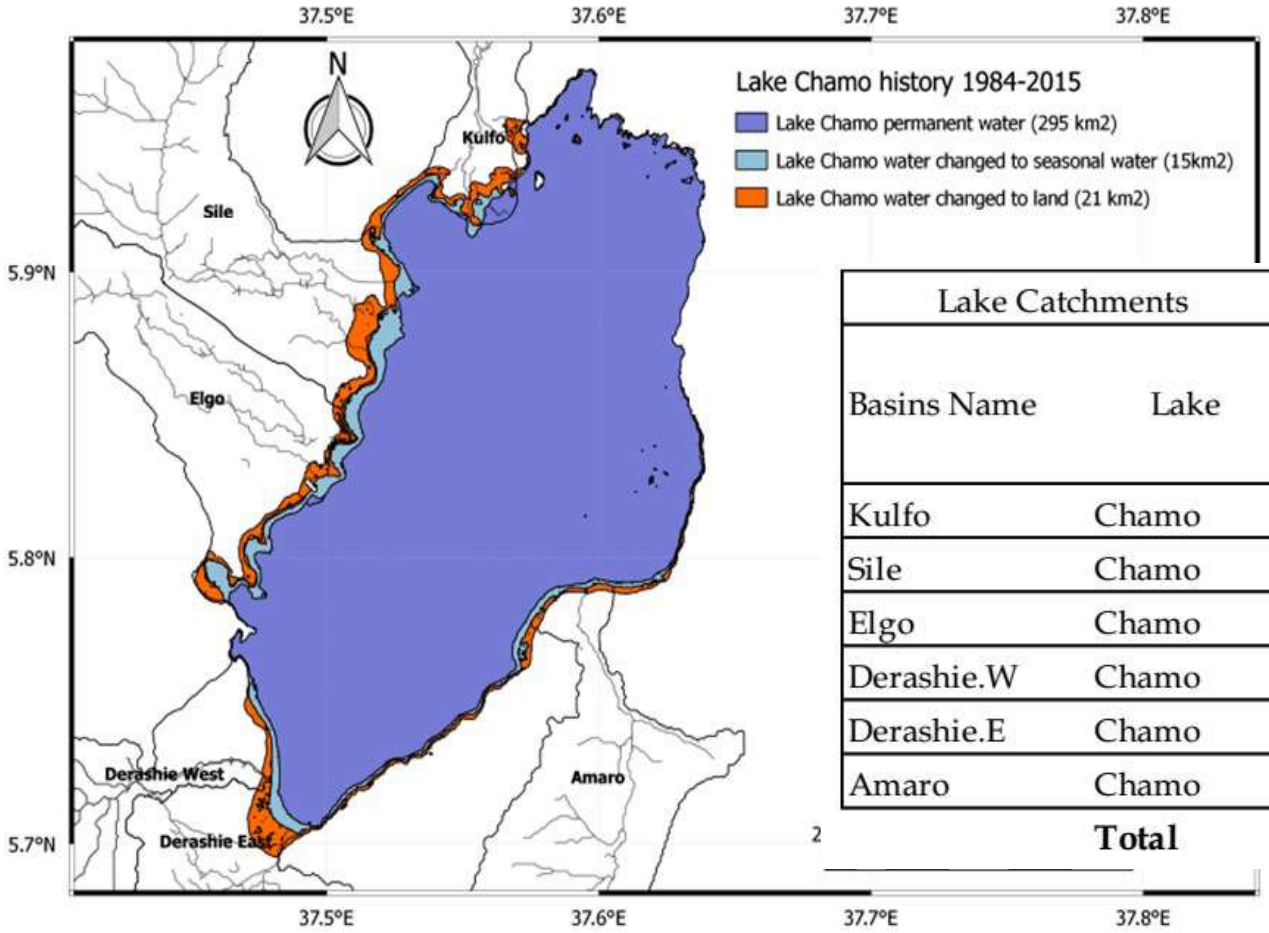


Vegetation Cover	Gain (ha)	Loss (ha)	Persistence (ha)	Persistence (%)	Net change (ha)
Water	3.69	134.10	37.80	21.99	-130.41
Bare Land	391.50	66.42	23.76	26.35	325.08
Arable Land	9821.07	1683.81	12747.96	88.33	8137.26
Moderate Vegetation	1794.06	8086.32	1497.42	15.62	-6292.26
Forest	1180.53	3220.20	1041.12	24.43	-2039.67

	1988		2015		
Vegetation Cover	Area (ha)	Area (%)	Area (ha)	Area (%)	Net change (%)
Water	171.90	0.60	41.49	0.15	-75.86
Bare Land	90.18	0.32	415.26	1.46	360.48
Arable Land	14431.77	50.57	22569.03	79.08	56.38
Moderate Vegetation	9583.74	33.58	3291.48	11.53	-65.66
Forest	4261.32	14.93	2221.65	7.78	-47.86
Total	28538.91	100.00	28538.91	100.00	

Sediment load

- Over the last 32 years (1984-2015) **1,559 hectare** of the permanent **water body** of Lake Chamo and its **wetland areas** have been transferred to **land** in the developed river delta.



Lake Catchments		Permanent Chamo Lake water changed to delta		
Basins Name	Lake	m^2	ha	%
Kulfo	Chamo	2611342	261.13	16.75
Sile	Chamo	4524688.00	452.47	29.02
Elgo	Chamo	3584088.00	358.41	22.99
Derashie.W	Chamo	2688284.00	268.83	17.24
Derashie.E	Chamo	1090893.00	109.09	7.00
Amaro	Chamo	1090893	109.09	7.00
	Total	**15590188**	**1559.02**	**100.00**

Second phase

- Focused on a quick win intervention plan,

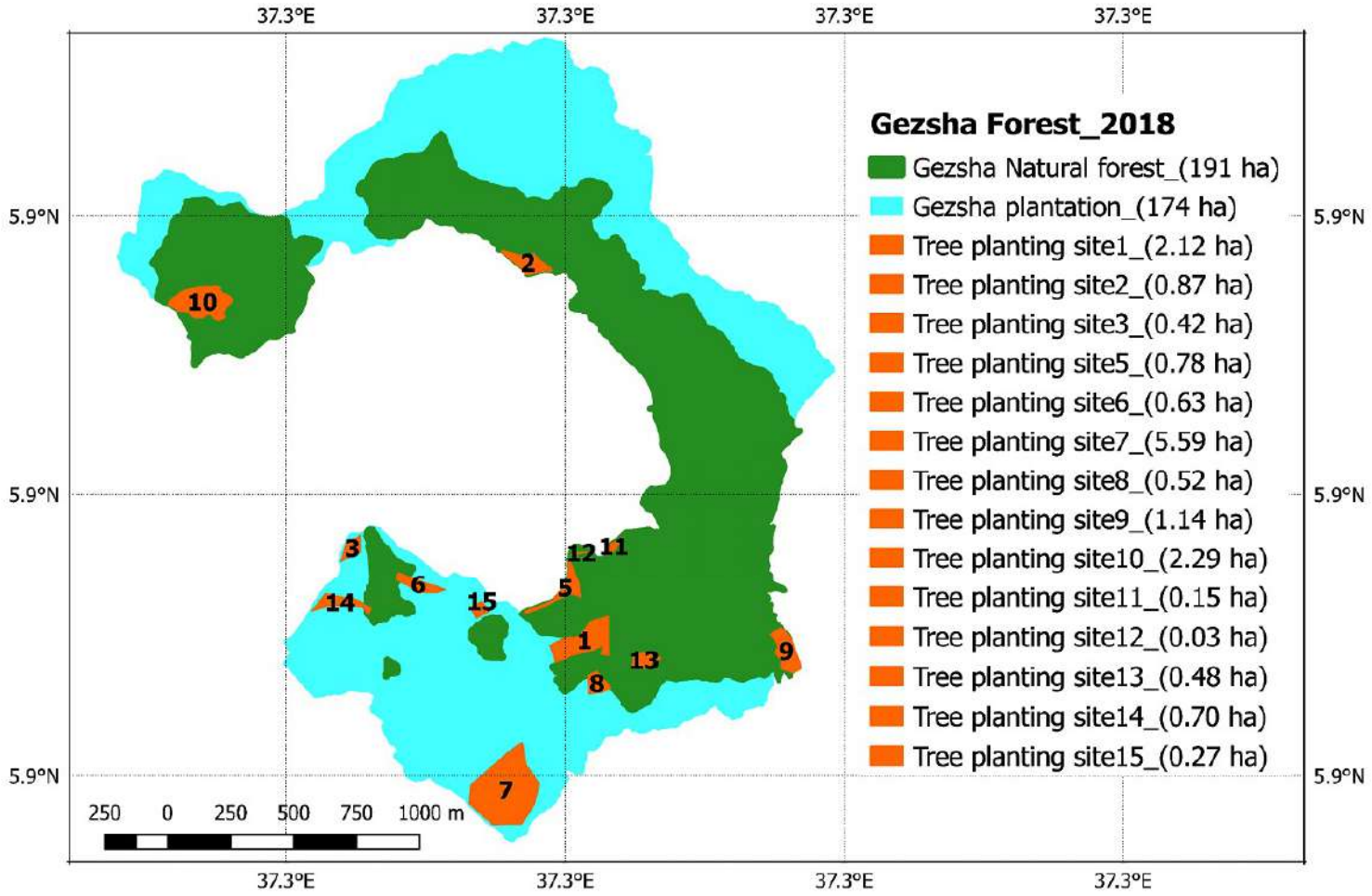
➢ Mapping the potential sites for a quick planting scheme at Gezsha Forest and Lake Chamo wetland developed

➢ The reforestation on the recovery of Gezsha Forest at the Watershed called elgo where the last natural forest at Lake Chamo basin

➢ And buffer zone delineation at Lake Chamo is an indispensable necessity and demanded an urgent action

• Regular meetings were conducted among key stakeholders to formulate two task force, (Technical Team and Management Team)

- The Technical teams were involved in the field works (GPS data collection for the delineation) and
- The Management team follow up the work and solving management and land ownership issues



Project Owner: Joint project

Collaboration among:

- Arba Minch University
- Nech Sar National Park
- GIZ-BFP-IWP,
- Gamo Gofa Zone EPFO
- Arba Minch Zuriya Woreda,
- Bonke Woreda

Project Leader:-

Dr. Fassil Eshetu

Mapping:-

- Gezsha Forest,
- Tree planting area (16 ha)

Location:-

- Near Grese town

Mapped by:- Dr. Fassil Eshetu
Arba Minch University
Joint Project Leader

Mapping Year and Date

- August 9, 2018
- High annual rainfall
- Mapping conducted at the end of wet season

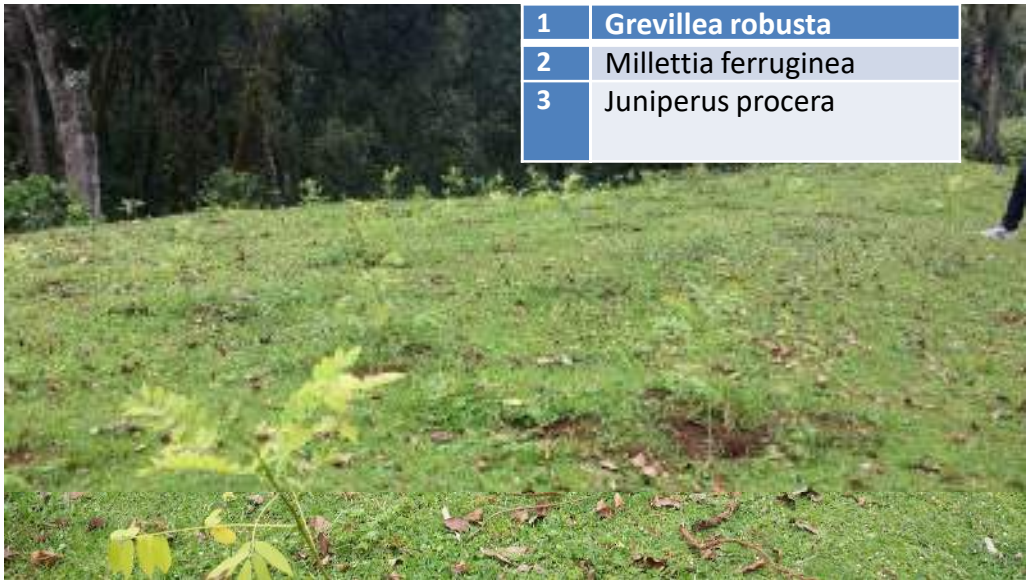
Mapping Scale

- Scale bar indicated in the map

Signature:

Fassil Eshetu Teffera (PhD)

Major findings in Gezsha Forest



1	**Grevillea robusta**
2	Millettia ferruginea
3	Juniperus procera

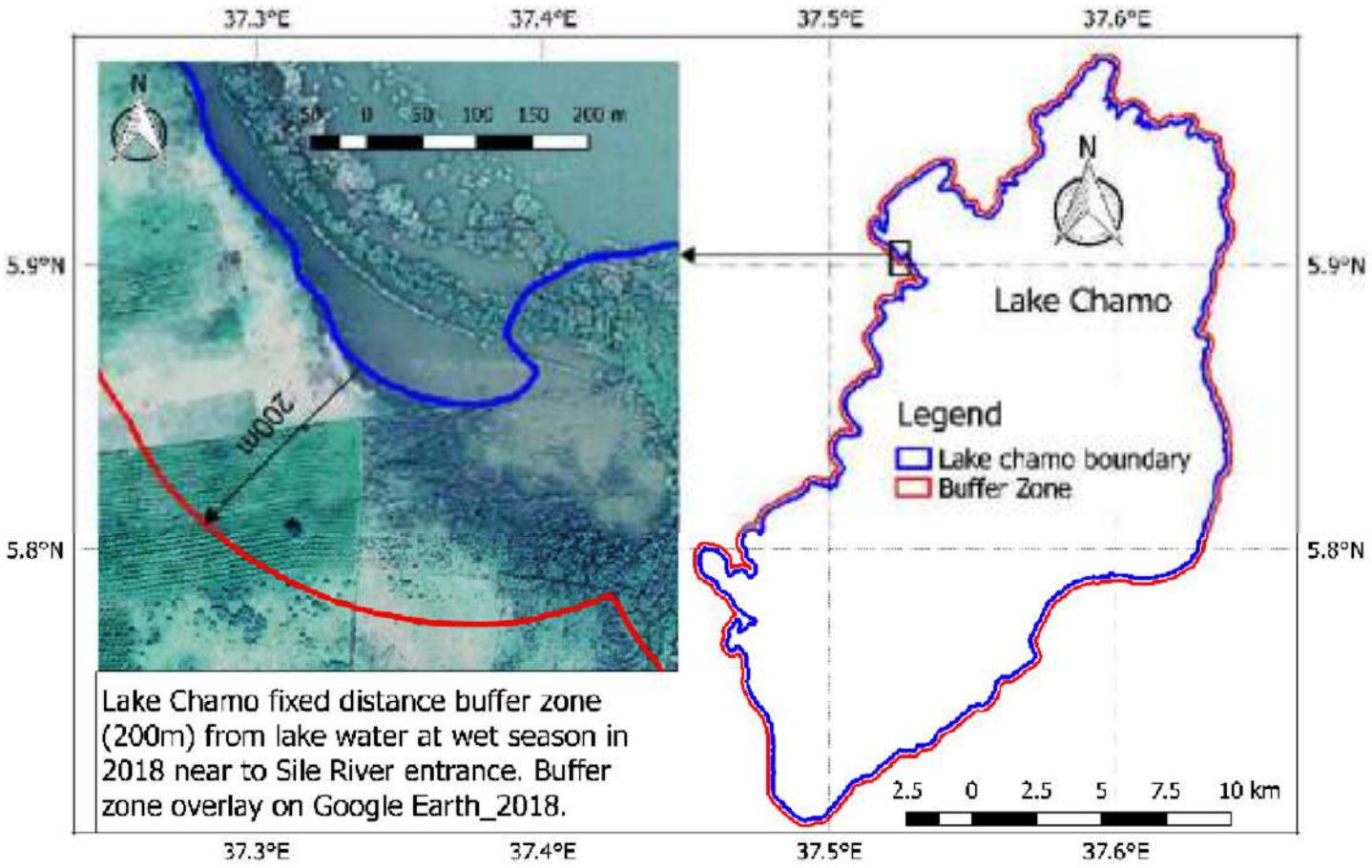
Debelie Osa

7ha
Dodonia viscos,
Treminalia brownii
Oxyntenatra abysinica
(bamboo)

- **Mapping Lake Chamo Buffer Zone**

➢ After a thorough discussion the management team decided to delineate to a fixed distance of 200m buffer zone from Lake Chamo boundary

➢ The delineation was conducted at end of wet season July 2018, which is ideal condition to delineate buffer zone



Lake Chamo fixed distance buffer zone (200m) from lake water at wet season in 2018 near to Sile River entrance. Buffer zone overlay on Google Earth_2018.

Project Owner: Joint project

Collaboration among:

- Arba Minch University
- Nech Sar National Park
- GIZ-BFP-IWP,
- Gamo Gofa Zone EPFO
- Arba Minch Zuriya Woreda,
- Bonke Woreda

Project Leader:-

Dr. Fassil Eshetu

Mapping:-

- Buffer Zone at Lake Chamo

Location:-

Lake Chamo

Sile River entrance at Lake Chamo

Mapped by:- Dr. Fassil Eshetu
Arba Minch University
Joint Project Leader

Mapping Year and Date

- August 9, 2018
- High annual rainfall
- Mapping conducted at the end of wet season

Mapping Scale

- **Scale bar indicated in the map**

Signature:

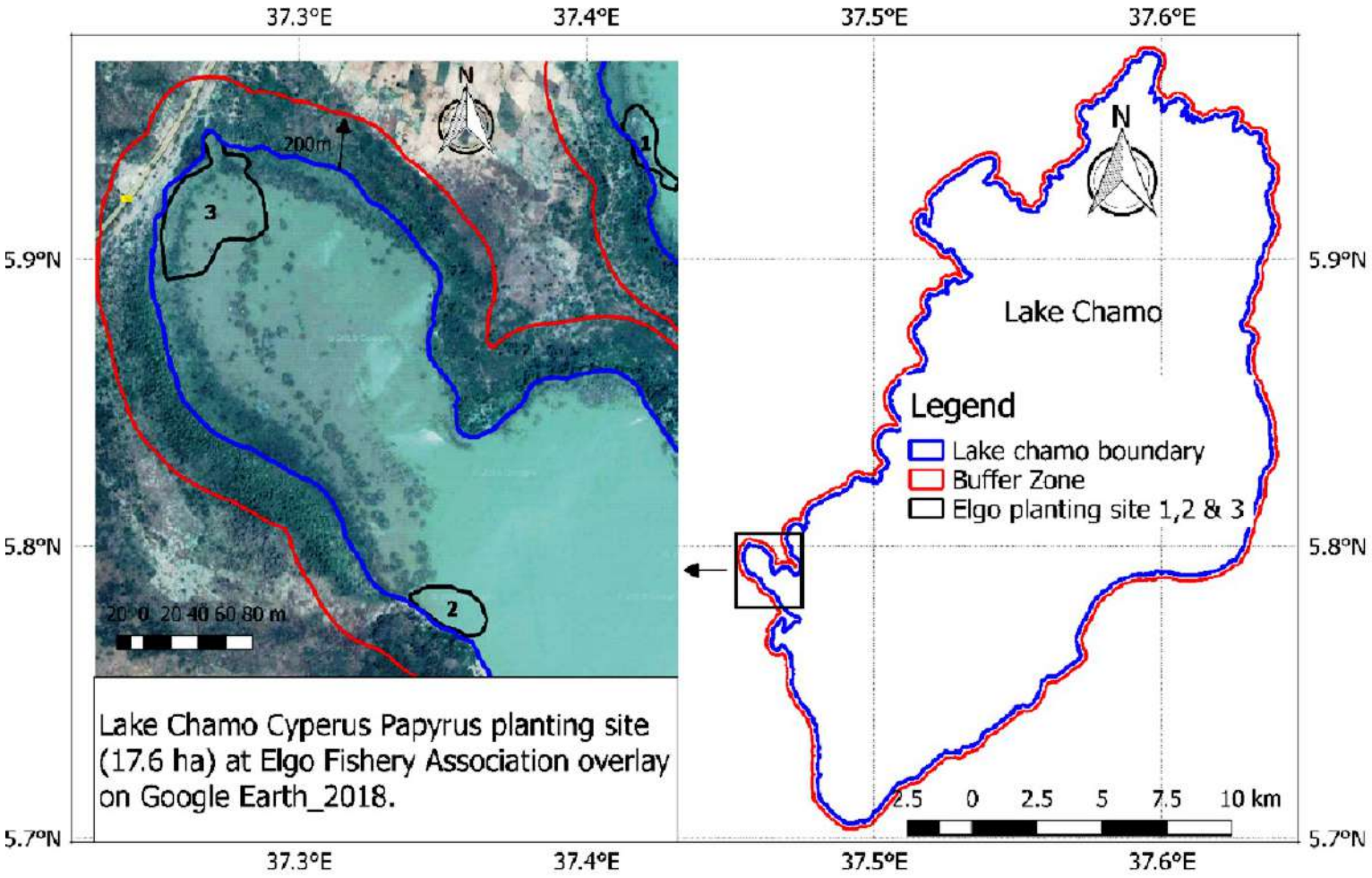
Fassil Eshetu Teffera (PhD)

- **Mapping Lake Chamo *Cyperus Papyrus* planting sites**

  - Three Fishery Associations along the westerns shore are selected as a planting site based on

    - ✓Severity of lake shore degradation (lake shore agriculture and over grazing)
    - ✓Motivations of the fishermen
    - ✓Natural resource availability
    - ✓Accessibility of roads

Mapping *Cyperus Papyrus* planting sites at Elgo Fishery Association



Project Owner: Joint project

Collaboration among:
- Collaboration among:
- Arba Minch University
- Nech Sar National Park
- GIZ-BFP-IWP,
- Gamo Gofa Zone EPFO
- Arba Minch Zuriya Woreda,
- Bonke Woreda

Project Leader:-

Dr. Fassil Eshetu

Mapping:-

- *Cyperus Papyrus* planting sites at littoral-wetlands

Location:-

Lake Chamo

Elgo Fishery Association

Mapped by:- Dr. Fassil Eshetu
Arba Minch University
Joint Project Leader

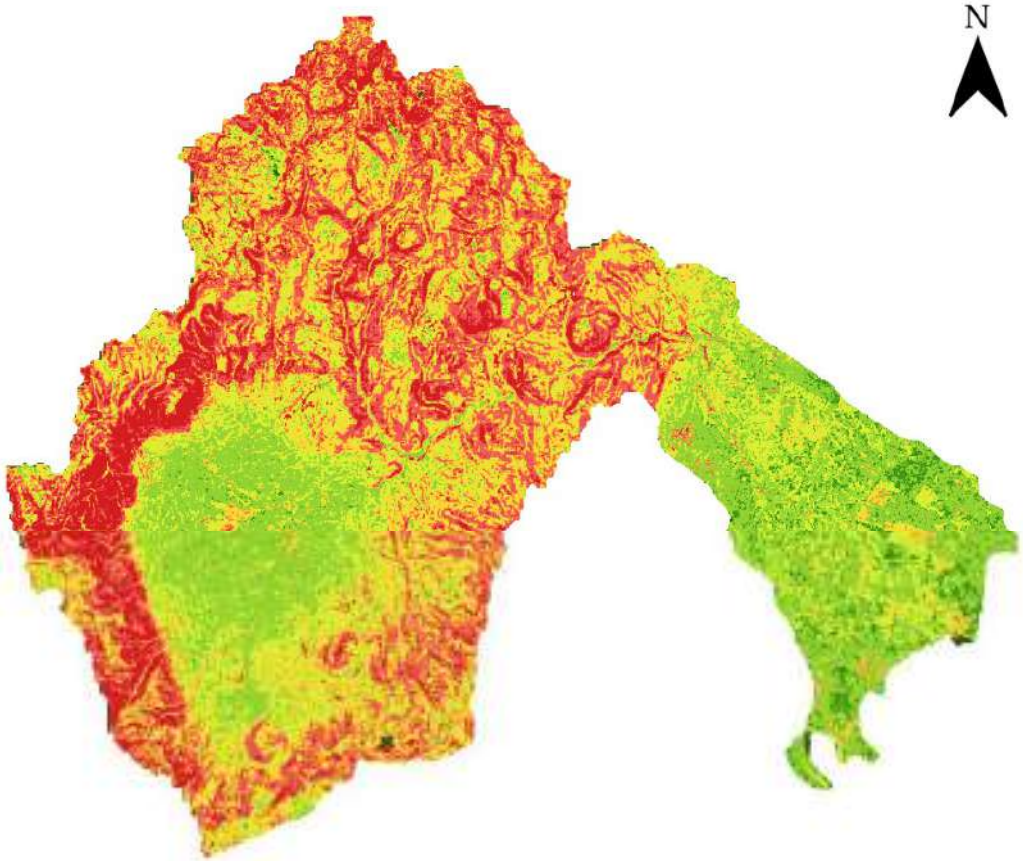
Mapping Year and Date
- August 9, 2018
- High annual rainfall
- Mapping conducted at the end of wet season

Mapping Scale
- **Scale bar indicated in the map**

Signature: Fassil Eshetu Teffera (PhD)

➢**The implementation needs further political commitment as the entire buffer zone is occupied by farmlands**

Third phase- Soil Erosion risk Map and soil loss



To tackle Over fishing

Source: Dr.Alemayehu H/Michael

Achievements

MoU with relevant stakeholders

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ነጭ ሳር ብሄራዊ ፓርክ

በደቡብ ብሄር ብሄረሰቦችና ህዝቦች ክልላዊ መንግሥት

በነጭሣር ብሔራዊ ፓርክ ጽ/ቤት፣ የአ/ምንጭ ዩኒቨርሲቲ፣ የጫሞ ሐይቅ ዓሣ አስጋሪዎች ማህበር፣ በጫሞ ሐይቅ የጀልባ አገልግሎት ሰጪዎች ማህበራት እና ሌሎች ባለድርሻ አካላት የጋራ መግባቢያ ሠነድ፤፤

ታህሳስ 2010 ዓ.ም

አርባ ምንጭ

Achievements

የመግባቢያ ሠነዱ ባለድርሻ አካላት ኃላፊዎች ሥምና ፊርማ

1. በጎሎ ሣር ብሔራዊ ፓርክ ጽ/ቤት ሃላፊ ስምና ፊርማ .....
2. የአ/ምንሜ ዩኒቨርሲቲ ተ/ም ዳይሬክተሬት ስምና ፊርማ .....
3. የጋሞ ጎፋ ዞን ደንና የአካባቢ ጥበቃ ጽ/ቤት ስምና ፊርማ .....
4. የጋሞ ጎፋ ዞን የእንስሳትና ዓሣ ሀብት ጽ/ቤት ስምና ፊርማ .....
5. በአርባ ምንሜ ዙሪያ ወረዳ አስተዳደር ጽ/ቤት ስምና ፊርማ .....
6. በአ/ም ዙ/ወ/ የደንና አካባቢ ጥበቃ ጽ/ቤት ኃላፊ ስምና ፊርማ .....
7. በአ/ም ዙ/ወ/ ፖሊስ ጽ/ቤት አዛዥ ስምና ፊርማ .....
8. በአ/ም ዙ/ወ/ ፍ/ቤት ፕሬዝዳንት ስምና ፊርማ .....
9. በአ/ም ዙ/ወ/ ፍትህ ጽ/ቤት ኃላፊ ስምና ፊርማ .....
10. የጫሞ ሐይቅ ዓሣ አስጋሪዎች ማህበራት ስምና ፊርማ .....
11. በአ/ም ዙ/ወ/ ማህበራት ማደራጃ ጽ/ቤት ስምና ፊርማ .....
12.. በአ/ም ከተማ አስተዳደር ጽዳትና ዉበት ጽ/ቤት ኃላፊ ስምና ፊርማ .....
13. የገንቻ ካንቻሜ ቀበሌ ቀበሌ አስተዳደር ኃላፊ ስምና ፊርማ .....
14. የጂአይዜድ ደንና ብዘሃ ህይዎት ፕሮግራም ተወካይስምና ፊርማ .....

List of responsible stakeholders for the MoU document

Achievements



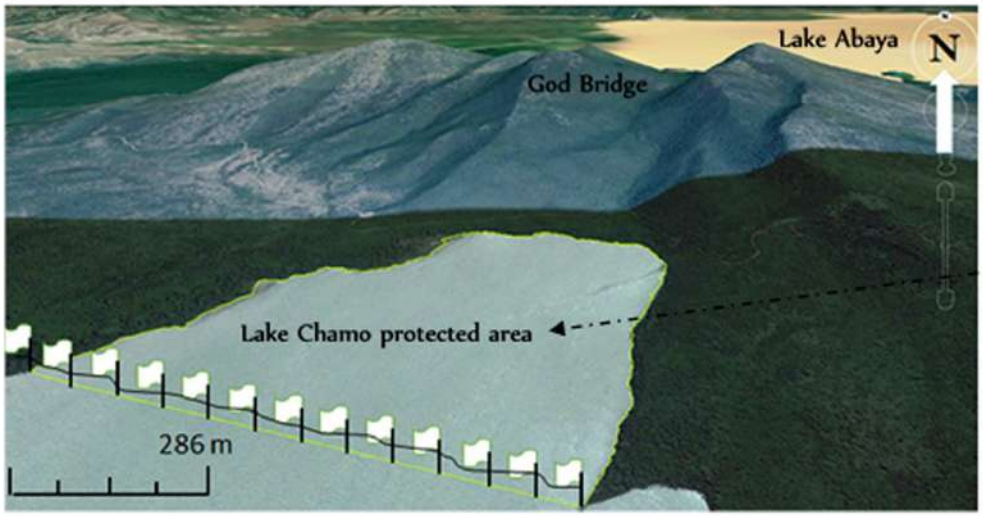






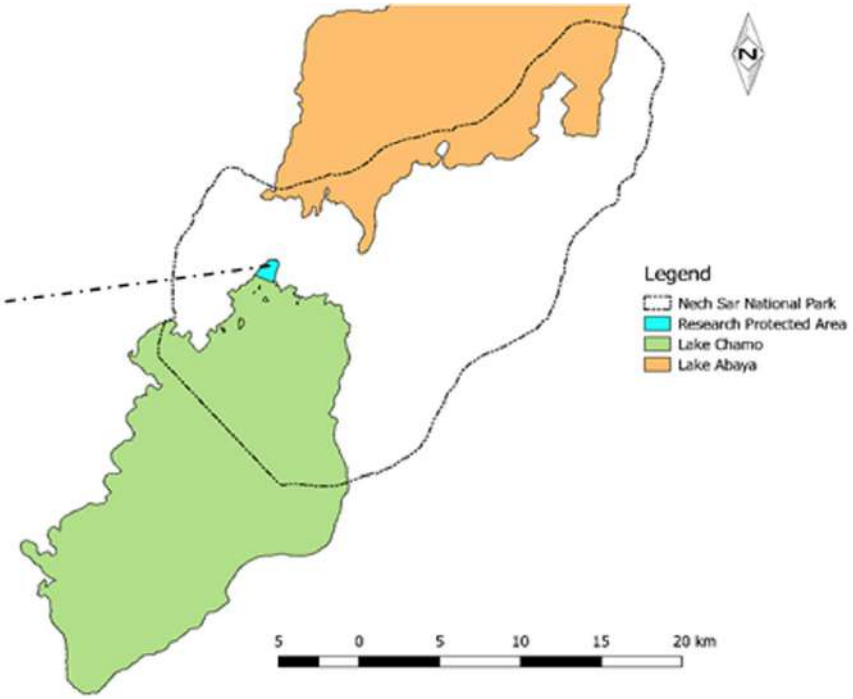
Achievements

- The two lakes jointly cover 15% of Nech Sar National Park
- For Lake Chamo at least 1 km^2 was delineated as research protected area **based on abundance of zooplankton and fish.**
- It includes overfishing areas both by legal and illegal fishermen, littoral areas which are important nursery habitat for the majority of fish species



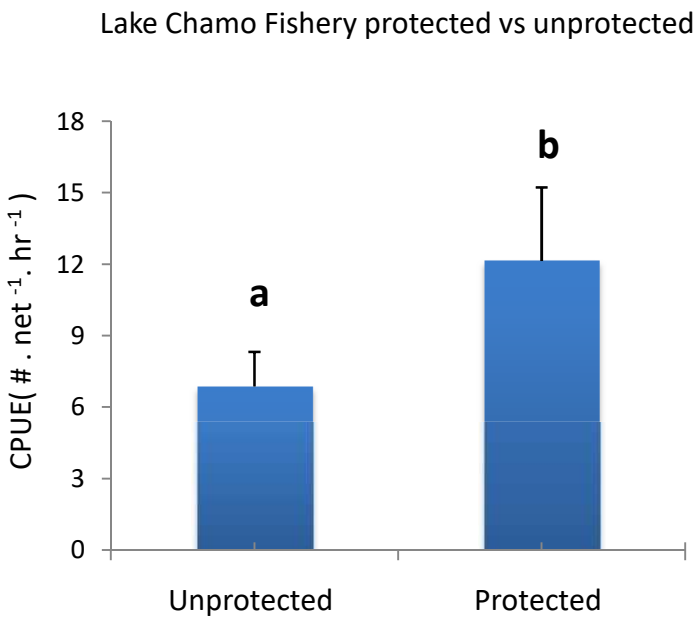
Lake Chamo Research Protected Area

Area (m^2)	Perimeter (m)	Length of water fence (m)	Number of water mark (No)	Distance between water mark (m)
1383257	5221	1257	13	97



Lake Chamo Research Protected Area =1.3 Km^2

Achievements



After 6 month of protection (lake fenced by floating fence)_fish fertilization zone

Conclusion and Recommendation

- The farmland encroachment in Abaya and Chamo raises concerns on the existence natural resource of the watershed.
- The intense land grapping at lakes shore also has serious consequences on the ecology of the lake
- Therefore the management and conservation of the lake should pay, amongst others, sufficient attention to restoring the tree cover density of the catchments, particularly in the very strongly degraded Sile-Elgo and Kulfo watersheds.
- Halting deforestation and planning and implementation of FLR in the entire Chamo catchment should be a priority

Why ecosystem valuation ?

- Loss of life and livestock due to crocodile attack
- Deterioration of fish production for the past decades
- Submerged roads and other infrastructures like crocodile ranch due to sediment
- Loss of soil from the entire catchment
- Habitat change impacts on Ecotourism
- Fertilizer application – ecosystem and economic loss

'Facing conservation' or 'conservation with a human face'? People–park interactions in southern Ethiopia

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- Go beyond the debate
  - 'people-oriented approaches' failed to achieve conservation goals
  - Nechisar national Park is a case where 'strict conservation approaches did not work

- By considering both the 'indirect' costs (such as loss of land) and the 'direct' costs' (such as historical and cultural ties with the land) important insights for a conservation strategy with a 'human face' could be gained.

- Conservation with a human face will require:
  - Involving the local people in the management of the park;
  - The historical rights of the pastoralists and the farmers over the area,
  - The legitimacy of their grievances with regard to the past management, are recognized
  - such strategies need political commitment and strong institutions at all levels


Thank You for Your
Attention