GEOGRAPHY OF ETHIOPIA AND THE HORN

CHAPTER ONE:

INTRODUCTION

1.1. : Definition, Scope and Themes of Geography

A.Definition of Geography

- It is difficult to get a single acceptable definition to all geographers at all times and places: because of:
  1. the dynamic nature of the discipline
  2. the changes in its scope and method of study
- Geography is the scientific study of the Earth that describes and analyses spatial and temporal variations of physical, biological and human phenomena and their interrelationships and dynamism over the surface of the Earth.

1.1.2. The Scope, Approaches and Themes of Geography

B.The Scope of Geography

- Geography acquired:
  - **Science:** a scientific of acquiring knowledge through and theoretical explanation of phenomena.
  - A system or methods (observation, identification, description, experimental & investigation) to acquiring knowledge.
- Geography is a holistic, dynamo-spatial and inter-disciplinary field of study. **geo-sphere** is the scopes of Geography.

- **The Geosphere (Lithosphere)** – referring to the rock layer
- **The Hydrosphere** – referring to the various water bodies
- **The Troposphere** –is the lower layer of the atmosphere
- **The biosphere-** refers to the biotic components of earth
- **The Anthroposphere-** refers to the cultural landscape

C. Approaches of Geography

- All geographic approaches are considering two continuums:
  1. **a human-physical continuum**: studies each geographic phenomenon in general manner in the case of world contexts.
  2. **a topical-regional continuum**: it is two types

     1.Topical: (systematic) studies one issue and looks at its spatial variations in all parts of the globe.

     2.Regional: studies the various characteristics of each region and their interrelationships divides the world into regions.

1.Themes of Geography/ principles of geography

- Geography has five basic themes namely:
  - Location (relative & absolute)
  - Place (toponym, site & situation)
  - human-environment interaction like; modification, dependency and adaptation.
  - Movement (idea, things, peoples, goods, services, plants & animals)
  - Region (formal & functional (nodal), macro, macro…)

i. Location

- a particular place or position.
- absolute location (latitude and longitude) and relative location.

ii. Place

- the physical and human aspects of a location.
- associated with toponym (name of a place), site (description of the features of the place), and situation (environmental conditions of the place).
- Each place in the world has its unique characteristics (landforms, hydrology, biogeography, pedology, human population and human cultures etc)

iii. Human-Environment Interaction

- involves three distinct aspects:
  1. **Dependency:** the ways in which humans are dependent on nature for a living.
  2. **Adaptation:** relates to how humans modify themselves, their lifestyles and their behavior to live in a new environment with new challenges.
  3. **Modification:** allowed humans to "conquer" the world for their comfortable living.

iv. Movement

- Movement entails the physical movement of living things (peoples, animals & plants), the transport of goods & services and the flow of ideas from one place on the earth to another place.

v. Region

- It could be:

1. **formal region:** characterized by homogeneity (distinctive) in certain phenomenon (soil, temperature, rainfall, or other cultural elements like language, religion, and economy).
2. **functional or nodal region:** characterized by functional (distinguish)interrelationships in a defined spatial system and a particular phenomena by the linkages binding (relationships).
3. **Micro or macro region:** relatively small and large region in respectively.

major school of thought in geography

- Geography has gone through a series of changes and developments.

1. **Environmental determinism:** natural environment is an influencing factor on humans' mode of living.
2. **Environmental possibilism**: human's ability to change its environment using the latest or better technologies.
3. **Quantitative revolution:** statistical techniques during 1950's and early 1960's.
4. **Applied geography:** the applicability of geographic knowledge in private business, government, non-profit organizations in the latter part of the 20th century.

1.2. Location, Shape and Size of Ethiopia & the Horn

1.2.1. Location of Ethiopia

i.Astronomical /mathematical location:

- Ethiopia is a landlocked country located between 3°N (Moyale) and 15°N (Bademe) latitudes and 33°E (Akobo) to 48°E (the tip of Ogaden in the east) longitudes. The east west distance is longer than the north-south distance.
- its latitudinal extension experiences tropical climate. longitudinal extension bring 1hour d/ce between the most easterly and most westerly points of the country.

ii.Relative location(vicinal): expresses the location of countries or places with reference to other countries , landmasses or water bodies.

The implications of the location of Ethiopia are:

a)Climate

- between Equator and Cancer implies that the country has a tropical climate (latitudinal extension) but modified by its altitudinal variation
- Location of Indian Ocean, Atlantic Ocean, African and Asian landmass affect the climate of Ethiopia.

b)Socio-cultural

- Christianity, Islam & Judaism due to its proximity to the Middle East.
- Ethiopia shares linguistic and cultural relationships with its neighbors

c)Political

- The political history of Ethiopia has been considerably influenced by:
  - Geopolitical considerations of superpowers.
  - Adjacency to the Red Sea (a major global trade route).
  - The Middle East geopolitical paradigms.
    - As a result, she has been exposed for external invasions but, remains free of external domination.

1.2. Location, Shape and Size of Ethiopia and the Horn

1.2.1. Size of Ethiopia

- approximately 1,106,000 square kilometers area cover
- 8th largest country in Africa and 25th in the World.
- Ethiopia have 5,260 kms boundary length
- About 0.7% of the country is covered by water bodies.
- The size Location and Shape of Ethiopia affects both the natural and human environment of the country. And it also have advantages and disadvantages for the country.
- **Explain the merits and demerits of Ethiopia's large size?**

1.2.3. Shape of Ethiopia

•Generally, shape can be divided into five main categories:

1. **Compact shape countries:** The distance from the geographic center of the state to any of the borders does not vary greatly.
2. **Fragmented shape countries:** their part divided in to other parts either water, land or other countries.
3. **Elongated shape countries:** They are geographically long and relatively narrow like Chile.
4. **Perforated shape countries:** A country that completely surrounds by another country. E.g Lesotho by South Africa
5. **Protrude shape countries:** Countries that have one portion that is much more elongated than the rest of the country like Myanmar and Eritrea.

- **Compactness:** is the ways of measuring shape of countries.
  - It is the deviation of the shape of a country from a circular shape of its own shape.
  - there is no country with absolutely circular shape or compact.
- There are four most commonly used measures of compactness.

1. **Area-Boundary ratio:** The higher the A/B ratio, the greater the degree of compactness.
2. **Boundary-Circumference ratio:** boundary of a country to circumference of a circle of its own size. nearer to 1 is more compact.
3. **Area-Circumference ratio:** the higher A/C ratio, the greater the degree of compactness.
4. **Area- Area (A/A") ratio:** nearer the ratio to 1, the more compact

Country	Area(km^2)	Boundary (km)	A/B ratio	B/C ratio	A/C ratio
Ethiopia	1,106,000	5,260	210.27	1.41	296.61

1.3. Basic Skills of Map Reading

What is a Map?

- **A map** is a two-dimensional scaled representation of part or whole of the Earth surface in a bird eye-view on a flat body of paper, black board, wood or cloth.
- **Map reading** is a systematic identification of natural and manmade features.
- these features cannot easily be observed and interpreted in real landscapes. So maps are essential to Geographers.

Importance of maps

- ✓ represented geographical details of regions i.e. geographical facts of an area such as relief, drainage, settlement etc.
- ✓ powerful tools for making spatial analysis of geographical facts of areas represented.
- ✓ Show location of geographical features by varied methods of grid reference, place naming etc.
- ✓ used on various disciplines like land use planning, military science, aviation, tourism, marine science, population studies, epidemiology, geology, economics, history, archaeology, agriculture etc.
- ✓ storage of the geographical data of areas represented.
- ✓ potentially used to asses‟ reliable measurements of the geographical features (can be of area size, distance etc).

Types of Map

A. according to their purpose and functions:

i. **Topographical maps:** general maps which depict one or more either natural or cultural features of an area.
   - ✓ The contents of topographical maps depend on purpose of a map, scale of a map, date of compilation, and nature of the land represented.

ii. **Special purpose/topical/statistical maps:** specific maps which show distribution of different aspects such as temperature, rainfall, settlement, vegetation, etc.

B. according to their scale:

- **Large-Scale Maps:** ≥ 1:50,000
- **Medium-Scale Maps: between** 1:50,000 and 1:250,000
- **Small-Scale Maps:** ≤ 1:250,000

Marginal Information on Maps (Elements of Maps)

- Marginal information help us to read and interpret the geographical information of an area represented. This includes:

a) Title: the heading of the given map which tells what the map is all about.

b) Key (legend): the list of all convectional symbols and signs shown on the map with their interpretation.

c) Scale: the ratio between the distance on the map and the actual ground distance. It can be expressed as representative fraction, statements/verbal scale and linear (graphic) scale.

d) North arrow: It is indicated with the north direction on a map.

e) Margin: Is the frame of the map. the end of the mapped area.

f) Date of publication: It is a date of map publication.

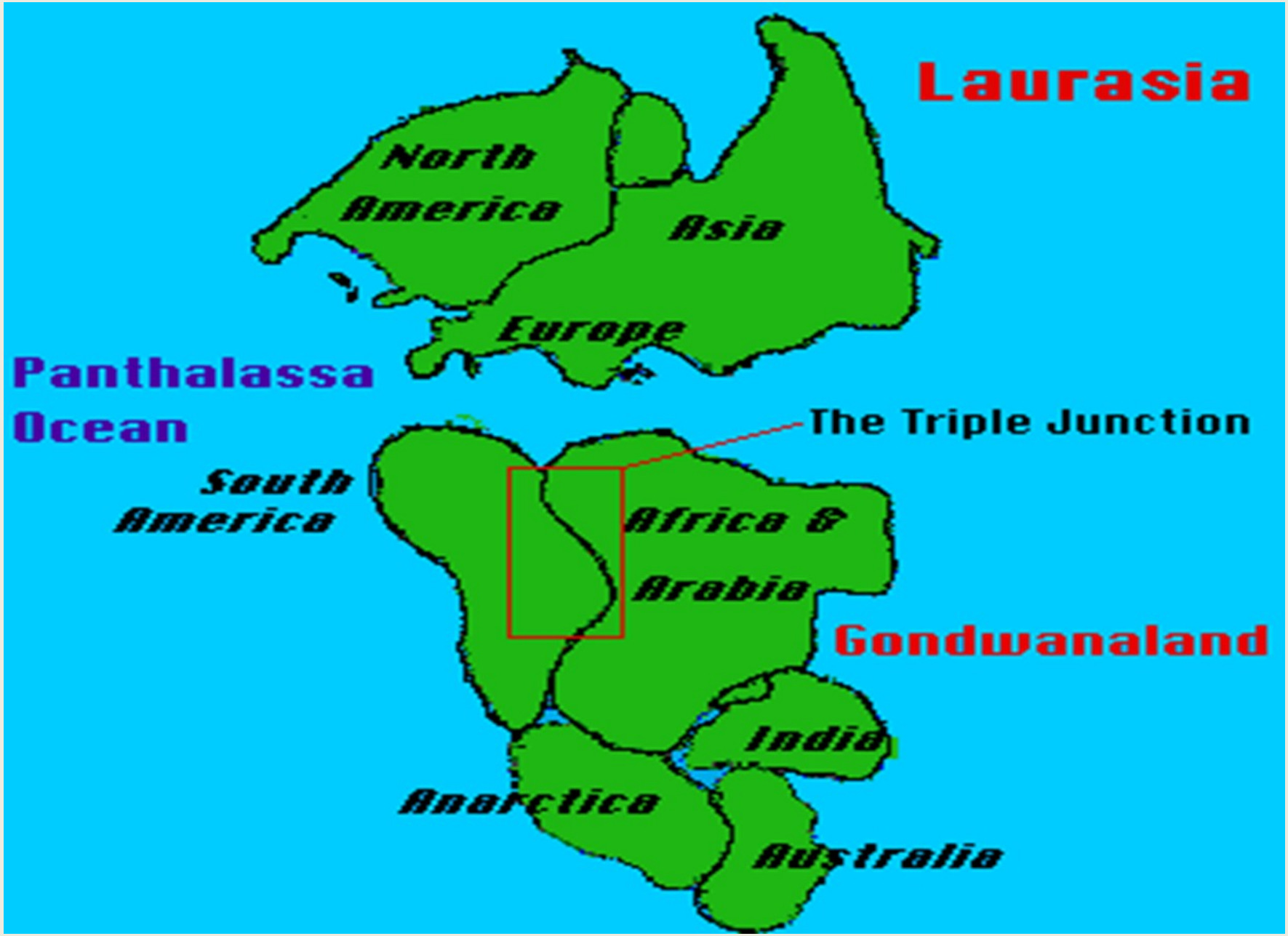
Basic Principles of Map Reading

- map reading have an abilities and skills of certain basic principles must be applied reading a map
  - Firstly map-reader translate map symbols into landscape images
  - Secondly, map-reader have knowledge of directions and location of the features on a specific map
  - Thirdly knowing the grid system give an accurate description of your location

CHAPTER TWO
THE GEOLOGY OF ETHIOPIA AND THE HORN

2.1. Introduction

- **Geology** is an Earth science that studies the processes and evolution of events of the earth and its materials which it is made of.
- a single huge continent called Pangaea.
- **Pangaea** was split into **Gondwanaland** (Africa is a part) and Laurasia. Later fragments into smaller continents over the last million years.
- **Continental drift Theory:** **Alfred Wegener** proposed the hypothesis that the continents were once assembled together as a super continent.


Laurasia
North America
Asia
Europe
Panthalassa Ocean
The Triple Junction
South America
Africa & Arabia
Gondwanaland
India
Antarctica
Australia

Wegener's principal observations were:

- **Fit of the continents/ coastal lines:** The opposing coastlines of continents often fit together.
- **Match of mountain belts and rock types:** mountains in West Africa, North America, Greenland, and Western Europe match up.
- **Distribution of fossils:** The distribution of plants and animal fossils on separate continents forms definite linked patterns if the continents are reassembled.
- **Paleo-climates:** rocks formed 200 million years ago in India, Australia, South America and southern Africa all exhibited evidence of continental glaciations.

2.2. Geologic Processes: Endogenic and Exogenic Forces

•Geology studies how Earth's materials, structures, processes and organisms have changed over time. These processes are divided into two major groups: internal and external processes.

1.The internal processes (endogenic):

a) **volcanic activity**
b) **tectonic processes** (faulting)
c) **orogenesis processes** (folding or mountain building)
d) **epeirogenesis** (slow rising and sinking of the landmass).

•internal processes result in building of structural and volcanic features like plateaus, rift valleys, Block Mountains, volcanic mountains, etc.

2.The external (exogenesis) or geomorphic processes:

- They include weathering, mass transfer, erosion and deposition.
- They act modifying, roughening and lowering them down.

2.3. The Geological Time Scale and Age Dating Techniques

- **geological time scale:** geology and history of life on Earth.
- The Earth is believed to have been formed approximately 4.5 billion years ago
- geological time divisions basically based on occurrence of significant geological events. likes:
  1. the relative position of land and sea
  2. the kind of climate
  3. the kind of animal and plant life
- do not usually consist of a uniform length of time.
- geological time scale involving four main units:
  1. **Epoch:** the smallest unit of time
  2. **Period:** epochs are clumped together into larger units.
  3. **Era:** Periods are combined together and make it.
  4. **Eon:** the largest period of geological time.

Era	Period	Began (m)	End (m)	Major Events (million years ago)
Cenozoic	Quaternary	1.6	Present	Major glaciers in North America and Europe (1.5)
	Tertiary	70	1.6	Rocky Mountains (65), individual continents take shape.
Mesozoic	Cretaceous	146	70	Dinosaurs extinct (65), western interior seaway and marine reptiles (144 – 65)
	Jurassic	208	146	Pangaea (one land mass) begins to break up (200)
	Triassic	225	208	First mammals and dinosaurs
Paleozoic	Permian	290	225	Greatest extinction on Earth (245)
	Pennsylvanian	322	290	First reptiles
	Mississippian	362	322	Coal-forming forests
	Devonian	408	362	First land animals and first forests (408)
	Silurian	439	408	Life invades land
	Ordovician	510	439	First fish appeared
	Cambria	600	510	Great diversity of marine invertebrates
Precam	Proterozoic	2,500	600	Marine fossil invertebrates (600)
	Archean	4,500	2,500	Earliest fossils recorded (3,500), earliest rock formation (4,000)

Age Dating Techniques

- There are two major techniques in age dating:

a) Relative dating: uses geological evidence and compare the ages of fossils and rocks by use two ways.

a) Look contain unique fossils or rock: then the rock was formed during that particular time period.

b) See layers of rocks: which one is younger and which is older

b) Absolute Dating: radioactivity discovered in 1896.

- unstable (radioactive elements) such as uranium (U) and thorium (Th) found within the rocks that naturally and regular decay to form different elements or isotopes.
- **half-life:** the time that takes radio active elements loss half of their original quantity of atoms. Due to a constant decayed process.
- **Doubter element (product):** the radio active element finaly change to stable and non radio active element.

- The two major **radiometric techniques** include:
  1. **Carbon-14 Technique:** organism death then carbon-14 begin to disintegrate at a known rate (half-life of 5730) without no further replacement of carbon from atmospheric carbon dioxide . used for dating of fossils.
  2. **Potassium-Argon Technique:** widely used for dating of sample rocks. Because, potassium-40 is abundant in micas, feldspars and hornblendes.
- Leakage of argon and the exposer of heat (above 125° C (257° F) create a problem for the age of the rock.it fail to reflect the time of original rock formation.

2.4. Geological Processes & Landforms of Ethiopia and the Horn

2.4.1. The Precambrian Era & Geologic Processes

- 4.5 billion - 600 million years ago.
- covers 5/6th of the Earth's history.

- The major geologic event of the Precambrian Era was:
  - Crystalline/basement rocks: were formed
  - Orogenesis: intense folding (gigantic mountains)
  - intrusive igneous activity: formation of huge mountain ranges

2.4.2. The Paleozoic Era & Geologic events

- 600-225m years ago.
- **Denudation:** gigantic mountains were subjected to intense and prolonged erosion.
- **Peneplained:** sediments of gigantic mountain were transported southward to form continental deposits (in Africa) and eastward (marine deposits in Indian Ocean) .
- In Ethiopia, rocks belonging to this Era are rare due to denudation.

2.4.3. The Mesozoic Era Geologic Processes

- 225-70 million years ago.
- Alternatively & slows sinking and rising (epeirogenesis)

There are 3 periods in Mesozoic era

a.Triassic Period

- Land sank South East to North West led to sea transgression to land then form **Adigrat Sand Stones** (1st Deposition)

a.Jurassic Period

-The sea depth increase; formed **Hintalo lime stones.**

a.Cretaceous period

-The land up lift to South East direction the sea was regression formed **upper sand stone**.

-Mesozoic sedimentary rocks cover 25% of the land mass of the country. That have the greatest potential for oil and gas deposits.

2.4.4. The Cenozoic Era Geologic Processes

- ✓ 70 million years ago – Present
- ✓ The Cenozoic Era is the most recent geologic Eras.
- ✓ The tectonic and volcanic activities that took place in this Era

There are two periods in Cenozoic Era

a.Tertiary Period

a)Lava Flow (Volcano) and Mountain: uplifting of the Arabo-Ethiopian landmass and outpouring of lava flood

b)Rift Valley was formed: theory of plate tectonics

- The movement of the crust in opposite directions producing tensional forces that caused parallel fractures or faults known as Rift Valley

a)Afar Triangle: widest part of the Rift Valley (200-300 km). The Red Sea, the Gulf of Aden, and the East African System meet at the triangular depression of the Afar.

b) **Kobar Sink:** lies about 125 meters below sea level.

The Spatial Extent of the Rift Valley

- ✓ The Ethiopian Rift Valley is part of the Great East African Rift system and the most unstable part of the country (numerous hot springs, fumorales, active volcanoes, geysers, and frequent earthquakes)
- ✓ from Palestine-Jordan up to Malawi-Mozambique 7,200 kms.
- ✓ 5,600 kms in Africa and 1,700 kms in Eritrea and Ethiopia.

b. Quaternary Period

i. Quaternary Volcanic Eruptions /Aden series include:

- recent volcanic activities after the formation of the Rift Valley. limited to the floor of the Rift Valley.
  - ✓Dubi, Erta Ale, Afrera etc.Of these, Erta Ale
  - ✓Volcanic hills and mountains, some of which are semi-dormant (Fantale, Boseti-Gouda near Adama, Aletu north of Lake Ziway, Chebbi north of Lake Hawassa etc.).
  - ✓Extensive lava fields and lava sheets: some of which are very recent Lava ridges and Thermal springs, fumaroles etc.

ii. Climate change and Quaternary deposition

- ✓ Climate change brought pluvial rain with cooler and wet periods in Africa.
- ✓ Most parts of Africa covered by Ice Age.

- ✓The heavy Pluvial Rains eroded the Ethiopian plateau and the eroded materials were deposited in the Rift Valley lakes.
- ✓Lastly, the Pluvial Rains replaced by dry climate and evaporation that led to extinct of great lakes and life from Rift Valley.

2.5. Rock and Mineral Resources of Ethiopia

- metallic minerals in Ethiopia is associated with the Precambrian

2.5.1. Brief Facts and Current State of Main Minerals in Ethiopia

- Geological surveys proved that Ethiopia has abundant mineral resources of metals and precious metals, coal, and industrial minerals.

✓**Gold:** Metekel, Adola, Sakoro, Lega-dembi, Shakiso, Akobo, Wondo, Borena, Sherkole, Didessa

- ✓ **Platinum:** Yubdo and Delatti in Wellega, Tullu Mountain area in Sidama etc
- ✓ **Tantalum:** Adola , Kenticha, Nedjo (Wellega), Chilga (Gonder), Ankober, Sululta, Muger, Aletu , Debrelibanos, Didessa, Wuchalle, Chuliga, Borkena etc.
- ✓ **Gemstones: (**including amethyst, aquamarine, emerald, garnet, opal, peridot, sapphire, and tourmaline). Wadla and Dalanta, woredas in Oromia and North Wello in Amhara
- ✓ **Potash:** Danakil (Dallol Depression)
- ✓ **Gypsum and Anhydrite:** Ogaden, Shewa, Gojjam, Tigray, and Hararghe
- ✓ **Clay:** Adola, Abay, Hawassa
- ✓ **Marble:** Mekelle, Adwa, Soka, Gonder, Benishangul-Gumuz and Gojjam
- ✓ **Construction stones:** Dire Dawa , Muger, Abay, Messebo

CHAPTER THREE

THE TOPOGRAPHY OF ETHIOPIA AND THE HORN

3.1. Introduction

- Altitude from 125 meters Kobar Sink) to the highest mountain (Ras Dashen 4,620 m.a.s.l) the fourth highest mountain in Africa.
- Ethiopian is the Roof of East Africa because of its heigh and large area
- diversity in topography affect the distribution of soil, climate, vegetation, wild life, socio-cultural and economic phenomena
- 56% of the Ethiopian landmass is above 1,000 meters and 44% is lowlands.
- From highlands:
  - 35% lower highland (1,000 - 2,000 m.a.s.l
  - 22% higher highland (>2,000 m.a.s.l)
  - 44% accounts above (1,500 meters).
  - What are the features of Ethiopian highlands?

- 1,000 m contour line used as a criteria for identified highland and lowland demarcation.

lowlands are characterized by:

- Fewer amounts of rainfall and higher temperature.
- High prevalence of tropical diseases.
- Lower population densities.
- Nomadic and semi-nomadic economic life.
- Vast plain lands favorable for irrigation agriculture along the lower river basins

3.2. The Physiographic Divisions of Ethiopia

- three major physiographic units can be identified in Ethiopia

1. The Western highlands (44%)and lowlands
2. The South-eastern highlands (37%) and lowlands
3. The Rift Valley (18%)

3.2.1. The Western Highlands and Lowlands

A.The Western Highlands

•This region is further subdivided into four groups of highlands.

I.The Tigray Plateau: Mount Tsibet (3988 m.a.s.l), Mount Ambalage (3291 m.a.s.l), and Mount Assimba (3248 m.a.s.l).

II.North Central Massifs:

- **in the Simen Mountain System:** mount Ras Dashen (4,620 m.a.s.l), Mount Weynobar/Ancua (4462 m.a.s.l), Mount KidisYared (4453 m.a.s.l), and Mount Bwahit (4437 m.a.s.l).
- **in the Debre Tabor Mountain System:** mount Guna (4,231m.a.s.l), Abune Yoseph (4,260 m.a.s.l)
- **in the Lasta highlands of Wello:** mount Birhan (4,154 m.a.s.l)
- **in Gojjam System:** Choke Mountain

III.The Shewa Plateau/central highlands

- smallest of the Western highlands.
- tributaries of Abay, Omo, and Awash
- Mount Abuye-Meda (4,000 m.a.s.l) in Northern Shewa, Mount Guraghe (3,721 meters) in the south.

IV.The South-western Highlands

- adjacent toAbay and Omo river valleys extends up to Kenya border and Chew Bahir in the south.
- tributaries of Abay (Dabus, Deddessa), Baro, Akobo and the Ghibe/Omo rivers.
- Guge Mountain is the highest peak (4,200 meters)

B. The Western Lowlands

- Along Ethio-Sudan boarder
- four groups of lowlands western lowlands are:

I. Tekeze lowland

- Setitu Humera lowland

II. Abay-Dinder lowland

- Abay drainage areas

III. Baro lowland:

- Largest and wettest from western lowlands
- arid or semi-arid climate conditions.
- has an extensive flat area suitable for mechanized agriculture.

IV. Ghibe/Omo lowland

- important towns found like; Humera, Metema, Omedla, Kurmuk, Gambella etc.

3.2.2. The South-eastern Highlands and Lowlands

a) The South-eastern Highlands

I. The Hararghe Plateau

- from the Chercher highlands in the south-west to Jigjiga
- Mount Gara-Muleta (3,381 m.a.s.l).

II. The Arsi-Bale-Sidama Highlands

- Bale and Arsi highlands are separated by Wabishebelle.
- Mount Kaka (4,180 m.a.s.l), Mount Bada (4,139 m.a.s.l) and Mount Chilalo (4,036 m.a.s.l), Tulu-Demtu (4,377 m.a.s.l) and Mount Batu (4,307 m.a.s.l).
- Sidama and Bale Highlands are separated by Ghenale river.
- Jemjem plateau, an important.
- Weyb River is important pass though Sof Omar cave.
- The Hararghe Plateau

b) The Southeastern Lowlands

- include the plains of Ogaden, Elkere, and Borena.
- harsh climatic conditions

- animal husbandry, irrigation agriculture and perhaps exploitation of petroleum and natural gas.
- Southeastern Lowlands dividing in to two sub plains:
  a) **Wabishebelle plain** (largest and hottest)
  b) **Ghenale Plain**

3.2.3. The Rift Valley

- **The Chew Bahir Rift:** broad and shallow depression of the Segen and Woito streams
- **The Afar Triangle:** largest and widest part of the Rift Valley (54% of Rift valley)
  a) Danakil depression (Kobar Sink) and lakes (Abe, Asale and Afrera are well known in Afar). Dallol can exceed 50°C
  b) economic importance includes salt extraction, irrigation along the Awash River and geothermal energy.
- **The Main Ethiopian Rift/Central Rift**
  i. Chamo, Arbaminch, Fentale, Boseti, Ziway, Chamo and Hawasa.
  ii. geothermal energy potential.
  iii. rain-fed agriculture is practiced

3.3. The Impacts of Relief on Biophysical and Socioeconomic Conditions

1) Agricultural practices
2) Settlement pattern
3) Transportation and communication
4) Hydroelectric power potential
5) Socio-cultural feeling
6) Impacts on climate
7) Impacts on soil
8) Impacts on natural vegetation

CHAPTER FOUR

DRAINAGE SYSTEMS AND WATER RESOURCE OF ETHIOPIA AND THE HORN

4.1. Introduction

- 71% of the earth's surface is covered by water
  - ✓97.5% is alkaline Only 2.5% is fresh water
- Glaciers 68.7%, ground water 30.1%, Permafrost 0.8% and surface waters 0.4%.
- Ethiopia called **water tower** from Eastern Africa but from the total land mass of Ethiopia, only 0.7 % covered by water bodies.

4.2. Major Drainage System of Ethiopia

- **Drainage:** the flow of water through a well-defined channel (principal river and its tributaries).

- **drainage system:** is a system/ network of drainage basin that consist all the river basins that flow in the same direction they drain.
- drainage system begin at a place called the source or headwater and ends at a point called mouth.
- **drainage pattern:** the arrangement of a river and its tributaries within their drainage basin/catchment area. It affect by geological processes, nature (structure of rocks), topography, slope, amount and the periodicity of the flow.
- **drainage basin/catchment area:** is the entire geographical space both the major river and its tributaries collectively flow either on surface (runoff) or subsurface flow.
- **Watershed:** is higher ground which serves as a source for streams/ rivers that divide the flow in to different directions within their own distinct drainage basins.

- In Ethiopia, based on topographical structures (slope); three drainage systems are exist.
    1) **Western Drainage Systems**
    2) **South-eastern Drainage Systems**
    3) **Rift Valley Drainage System**

4.2.1. The Western Drainage Systems

- largest drainage systems in volume (60%) and coverage of total area in the country (40%).

I. **Abay basin:** origin from Sekela (Choke mountain) and join with Nile at **Kartum** finally drain to Mediterranean sea.

II. **Tekeze basin:** (named Atbara in Sudan) has two main tributaries (Angereb and Goang). Join with Nile at North Sudan.

- **Baro and Akobo**: join in South Sudan known as Sobat River
- **Ghibe / Omo:** is inland drainage to Chew-Bahir at the mouth of Lake Turkana

4.2.2. The South-eastern Drainage Systems

- Highest evaporation of water
- mainly drained by:
  I. **Wabishebelle:** longest river in Ethiopia.
  II. **Ghenale:** the name given Dawa river in Somalia finally flow to Indian Ocean.
- 25 % of the annual water flow of Ethiopia.

4.2.3. The Rift Valley Drainage System

- The Awash River originates from Shewan plateau

River	Name (Abroad)	Catchment (km^2)	Length (inside)	Tributaries
Abay	Nile	198,508	800	Didessa ,Fincha, Guder, Muger, Jemma, Beshillo…
Shebelle	-	205,407	1,340	Erer, Yerrer, Mojo, Ramis
Genale	Dawa	168,141	480	Dawa, Wybe, Welmel, Mena
Awash	-	113,709	1,200	Akaki, Kesse, Borkena, Mille
Tekezze	Atbara	87,733	608	Angherb, Ghiba, Guange
Ghibe/Omo	Omo	77,205	760	Gojeb, Gilgelghibe
Baro	Sobat	78,718	227	Akoba, Ghilo

4.3.2. General Characteristics of Ethiopian Rivers

- Almost all major rivers originate from the highlands
- Majority of Ethiopian rivers are trans-boundary
- seasonality of rainfall leads to runoff, destroying small bridges, damage roads and flooding low lands
- Due to surface ruggedness they have rapids and waterfalls along their course
- They have cuts, steep-sided river valleys and deep gorges along their courses
- serve as boundaries both international and domestic administrative units.

4.3.2. The Ethiopian Lakes

- **natural lakes or Manmade/ artificial lakes:** Koka, Fincha and Melka Wakena, and many other lakes dammed following hydroelectric power generation projects

I. Rift valley Lakes

- majority of lakes in Ethiopia are clustered in rift valley system
- Lake Tana, the largest lake in Ethiopia
- result of tectonic process that took place during Quaternary period of Cenozoic era.

II. Highlands Lakes

- ✓ Lake Tana, the largest lake in Ethiopia
- ✓ Other are Bishoftu, Wonchi, Hayk, Zikwala and Ashenge

Lake	Area (km^2)	Max. Depth(m)	Lake	Area (km^2)	Max. Depth(m)
Tana	3600	9	Abijata	205	14
Abaya	1162	13.1	Awassa	129	10
Chamo	551	13	Ashenge	20	25
Ziway	442	8.95	Hayk	5	23
Shala	409	266*	Beseka	48.5	11
Koka	205	9			

4.3.3. Subsurface (Ground) Water Resource of Ethiopia

- has lower ground water potential

4.4. Water Resources Potentials & Development in Ethiopia

a) Hydro-electric Potential

- Grand Ethiopian Renaissance Dam (GERD)
- Gilgel Gibe, Lake Aba Samuel, Koka, Tis Abay, Awash, Melka Wakena, Sor, Fincha, Gibe/Omo, Tana Beles and Tekeze, Hydro-electric.

b) Irrigation and Transportation

- The Baro-Akobo and Genale Dawa river systems have large irrigation potential
- Majority of Ethiopian rivers are not suitable for transportation.
- Baro, Lake Tana and Abaya are relatively used for transportation
- From lake Tana estimated 8,000-10,000 tons, Chamo is estimated at 4,500 tons per year

c. Fishing and Recreation

- 60% fish supplies are coming from main Rift Valley lakes.
- variety of fish, birds and other aquatic life forms, waterfalls, rivers, lakes, variety of wild life and endemic are important for recreation and tourist to Ethiopia

CHAPTER FIVE

THE CLIMATE OF ETHIOPIA AND THE HORN

5.1 Introduction

- **Weather:** is the daily conditions of the atmosphere elements like temperature, atmospheric pressure, humidity, wind speed and direction, cloudiness and precipitation in the troposphere.
- **Climate:** the average conditions of the atmosphere over long time periods.

5.2. List and explain the elements of weather and climate?

5.2.1. Controls of Weather and Climate

- The determining factors for the variations of weather and climate between places are called controls of weather and climate

a. Latitude/ angel of the sun

- Equatorial area has low angle & polar areas has slanting angle determine the strength of sun shines
- Ethiopia found around the equator that has:
  - high average temperatures and sun shines
  - high daily and small annual ranges of temperature
  - no significant variation in length of day and night between summer and winter

b. Inclination of the Earth's Axis

1)solar distance: The earth inclination 23 ½ ° from their axis and also 66 ½ ° from their Orbit. This bring the difference in solar distance between polar & equatorial areas.

i. **aphalion**: polar distance estimated 152,106,000 kms

ii. **perhelion**: Equatorial distance from sun estimated 147,103,000 kms.

2) Position of the sun

- The earth rotate on its axis determines day and night and also revolves on its orbit around the sun determine the seasons.

a) Equinox

- overhead sun appears around the equator when the position of the sun seen across equator
  - equal length of day and night
  - high sun light reach around equatorial areas.
- Equinox appears twice a year.

i. The Vernal (spring) equinox: March 21st

- Appear when the Sun's rays crosses the equator and directly reach to the Northern Hemisphere
- marks the offset of the vernal equinox.

ii. The Autumn equinox: 23rd

- appears when the sun crosses the equator
- on 23rd of September marks the offset of the Autumn equinox

b) Solstice

- overhead sun appears either northern or southern hemisphere

i. The summer Solstice: June 21st

- sun is directly over head on Tropic of Cancer 23 ½ °N
- The northern hemisphere has maximum tilt towards the sun experiencing longest daylight of the year.

ii. The winter solstice: December 22nd

- overhead sun directly above 23 ½ ° S on the Tropic of Capricorn.
- maximum insolation reach to the Southern Hemisphere.

c. Altitude

- The height of location above the sea level.
- When increasing elevation temperature will be decrease.

- lapse rate: is the average rate of temperature changes per unit of altitudinal change.
- The normal lapse rate is 6.5°C/km per rise in altitude.

Types of lapse rate

- Three types of lapse rates are identified;

i. Dry adiabatic laps rate/rise dry air (unsaturated)

- temperature changes occur not only by the result of heat addition or withdrawal from outside sources, but rather are the consequence of internal processes of expansion and contraction of air parcel.

- adiabatic lapse rate is the rate at which the temperature of an air parcel changes in response to the expansion or compression process associated with a change in altitude.
- the major cause of adiabatic is vertical displacements of unsaturated air
- When unsaturated air rises, it expands(cover large volume) because it has less weight & pressure in air parcel.
- unsaturated air has the rate of 10°c/1000m to heating or cooling in every of change in elevation.

ii. Wet Adiabatic laps rate/rise wet air (saturated)

- saturated or precipitating air rising or sinking that changes its temperature. This process is called wet adiabatic temperature change.
- The rate of cooling of wet air is approximately 5°c/1000m.

iii. Environmental lapse rate or Atmospheric lapse late

- the actual change of temperature with altitude increase or decrease.
- lower layer of atmospheric is more warmer than upper layers. Because:
  - atmospheric heat is received directly from the earth's surface and only indirectly from the sun.
  - high density of the air
  - more water vapor and dust particle are exist
- The rate of change is 6.5°c/1000.

5.3. Spatiotemporal Patterns and Distribution of Temperature and Rainfall in Ethiopia

5.3.1. Spatiotemporal Distribution of Temperature

- Altitude and Latitude are the two most important element in determining temperature in Ethiopia.

Altitude (meter)	*Mean annual Temp °C*	*Description*	*Local Equivalent*
3,300 and above	*10 or*	Cool	*Wurch*
2,300 - 3,300	*10*	Cool Temperate	*Dega*
1,500 - 2,300	*15*	Temperate	*Woina Dega*
500 - 1,500	*20*	Warm Temperate	*Kola*
below 500	*25 and above*	Hot	*Bereha*

5.3.2. Spatiotemporal Distribution of Rainfall

- Rainfall system in Ethiopia is needs an understanding of the position of Inter Tropical Convergence Zone (ITC), pressure cells and Wasterlies &Trade Winds. Thus, the rainfall system in Ethiopia is characterized by spatial and temporal variabilities.

Inter Tropical Convergence Zone (ITCZ)

- convergence of Northeast Trade winds and the Equatorial Westerlies
- It is a low-pressure zone
- oscillation of ITCZ position is a causes for variation in the Wind flow patterns over Ethiopia and the Horn

Seasonal or Temporal Variability

i. Summer (June, July, August)

- sun overheads north of the equator(Tropic of Cancer 23 ½ °N)
- High pressure cells develop on the Atlantic and Indian Oceans around the tropic of Capricorn
- Equatorial Westerlies (Guinea monsoon) winds from southwest Atlantic Ocean and South easterly from Indian Ocean blow to Ethiopia except lowlands in Afar and Southeast most parts of Ethiopia receive rainfall.

ii. Autumn (September, October and November)

- ITCZ shifts towards the equator weakening the equatorial westerlies
- Weak south easterlies from Indian Ocean showers the lowlands in southeastern part of Ethiopia.

iii. Winter (December, January and February)

- ITCZ shifts towards farther to Capricorn 23 ½°S.
- High pressure cells develop on Arabian Land
- northeasterly winds originating from the landmass of Asia crossing the Red Sea carry very little moisture and supplies rain only to the Afar lowlands and the Red Sea coastal but most parts of Ethiopia is stay drying.

iv. Spring (March, April and May)

- ITCZ again shift to equator twice a year
- South-easterlies from the Indian Ocean provide rain to the highlands of Somalia and to the central and southeastern lowlands and highlands of Ethiopia.

Rainfall Regions of Ethiopia

i. Summer rainfall region

- except lowlands in Afar and Southeast parts of Ethiopia others parts receive rainfall.
- having rainfall of 1,000 mm or more/year

ii. All year-round rainfall region

- southwestern Highlands and windward side Mountain
- average rainfall varies from 1,400 to over 2,200 mm/year

iii. Autumn and Spring rainfall regions

- South eastern lowlands of Ethiopia receive rain during autumn and spring seasons
- varies from less than 500 to 1,000 mm/year.

iv. Winter rainfall region

- Red sea and some parts of the Afar region receive rain.
- Very low amount of rain receive

5.4 Agro-ecological Zones of Ethiopia

Zones	Altitude (m)	Mean annual rainfall (mm)	Length of growing periods (days)	Mean annual temperature (^{0}C)	Area share (%)
Wurch (cold to moist)	>3,200	900-2,200	211–365	Below 10	0.98
Dega (cool to humid)	2,300 - 3,200	900-1,200	121–210	≥11.5–17.5	9.94
Weyna Dega (cool sub humid)	1,500 - 2300	800-1,200	91–120	>17.5 – 20.0	26.75
Kola (Warm semiarid)	500 - 1,500	200-800	46–90	>20.0 – 27.5	52.94
Berha (Hot arid)	<500	Below 200	0–45	>27.5	9.39

5.5. Climate Change: Causes, Consequences and Response Mechanisms

✓Climate change refers to a change in the state of the climate. (mean, variability) over time due to either natural variability or human activities.

5.5.1. Current Trends of Climate in Ethiopia

- Ethiopia ranked 5th out of 184 countries in terms of its risk of drought.

- 12 extreme drought events were recorded between 1900 and 2010. seven of them are occurred since 1980.
- resulted in famines, harvest failures, livestock deaths

Trends in Temperature Variability

- rise mean annual temperature from 0.2°C to 0.28°C/decade over the last 40-50 years.
- 1.3°C has been observed between 1960 and 2006.
- Consequently, the country's minimum temperature

Trends in Rainfall Variability

- Spring and Summer rainfall have shown decline by 15-20% between 1975 and 2010.
- The average Precipitation has remained fairly stable over the last 50 years but Rainfall variability is increasing that has strong implications for crop production & husbandry

5.5.2. Causes of Climate Change

A. Natural Causes

- **Earth orbital changes:** The earth is tilted at an angle of 23.5°c lead to small but climatically important changes in the strength of the seasons.

- **Energy Budget:** Sun's energy output small changes over an extended period of time can lead to climate changes.
  - Sun spot varied from 80 km^2(dark)-80,000km^2(light) each spot has varies life cycle in every 50 years 1°c change in sun energy.
- **Volcanic eruptions:** releases large volumes of sulphur dioxide, carbon dioxide, water vapor, dust, and ash into the atmosphere. can increase planetary reflectivity causing atmospheric cooling.

B. Anthropogenic Causes

- Industrial activities, construction, transportation, buildings, decomposition of wastes in landfills, agriculture, ruminant digestion and manure management, synthetic compounds manufacturing, clearing of land for agriculture, industrial activities, and other human activities have increased concentrations of greenhouse gases

Green house gases and its effects:

-Gases that an ability to absorb heat are called greenhouse gases

-Such gases: Methane, Water vapor, CO_2, CO, NO_2, CFC etc.

-GHs bring global warming

5.5.3. Consequences of Climate Change

- Impacts on human health
- Impact on water resources
- Impact on Agriculture
- Impact on Ecosystem
- Global warming, increase in sea level, desertification, drought, shift of tropics, tropical diseases, loss of bio-diversity etc

5.5.4. Climate Response Mechanisms

•There are three major response mechanisms to climate change namely:

1)Mitigation

2)adaptation

3)resilience.

i. Mitigation and its Strategies

- Taken an actions to reduce and control greenhouse gas emissions or avoid significant human interference with the climate system.
- some mitigation measures are:
  - Practice Energy efficiency
  - Increase the use of renewable energy such as solar
  - Efficient means of transport implementation (electric public transport, bicycle, shared cars etc).

ii. Adaptation and its Strategies

- adjusted to actual or expected future climate and coped with changes in climate and extremes with varying degrees of success

- **Some of the major adaptation strategies include:**
  - building flood defenses,
  - plan for heat waves and higher temperatures,
  - installing water-permeable pavements to better deal with floods and storm water
  - improve water storage and use are some of measures taken by cities and towns.
  - landscape restoration and reforestation,
  - flexible and diverse cultivation to be prepared for natural catastrophes
  - preventive and precautionary measures (evacuation plans, health issues, etc.)

iii.resilience and its strategies: recycle & carbon clean methods

CHAPTER SIX

SOILS, NATURAL VEGETATION AND WILDLIFE RESOURCES OF ETHIOPIA AND THE HORN

6.1. soil formation

- Ethiopia to have varied soil, geological process, varied climatic and biological diversity.
- the distribution of wildlife and natural vegetation in Ethiopia and the Horn is controlled by many factors among which are climate, soil types, drainage, etc.
- Natural vegetation are vital that provide shelter, food, source of fuel, pasture and grazing, raw material for industries
- Ethiopia also have money Unique endemic fauna and flora resources.

6.2. Ethiopian Soils: Types, Degradation and Conservation

6.2.1. Soil Composition

-Composed from; minerals (45%), air (25%) water (25%) organic matter (5%) & parent materials (rocks)

soil formation

•The formation and spatial variability of soils in Ethiopia is largely related the factors of topographic, climatic, parent material (rocks), land use(human activities) and time.

•**Weathering:** the processes of soil formation

•Three types of weathering

i.Mechanical (physical) weathering

- Physical disintegration of rock without changing composition.
- due to the action of rainwater(frost), extremes of temperature(exfoliation), and biological activity(plant & animals)

ii. Biological weathering

- weathering involves the weakening and subsequent disintegration of rock by plants, animals and microbes.
- Bring both chemical and physical compositional change

iii. Chemical weathering

- involves the modification of the chemical and mineralogical composition of the weathered material.
- different processes can result in chemical weathering.
- most common chemical weathering processes are hydrolysis, oxidation, reduction, hydration, carbonation and solution

Soil Properties

- Soils have two basic properties:

1) Physical properties

- Physical composition and major soil components. such as texture, structure, porosity etc.
- These properties affect air and water movement in the soil, and thus the soil‟s ability to function.

2) Chemical Properties

- various chemical constituents. like, availability of minerals, electrical conductivity, soil pH, etc. Soil chemical properties affect soil biological activity and indirectly the nutrient dynamics.

6.2.2. Major Soil Types in Ethiopia

- Soils of Ethiopia are basically derived from crystalline, volcanic and Mesozoic sedimentary rocks.
- FAO has identified 18 soil associations in Ethiopia
- major soils (11 soils) cover about 87.4% of the land area of Ethiopia.

Soil	Environmental condition	Characteristic	Agricultural suitability	Occurrence
Nitosols	associated with highlands with high rainfall, formed on forest	gently land, strongly weathered, reddish-brown, rich in non-soluble:Fe, Al & non soluble like Ka, Ca	productive than other tropical soils, leaching	Trap series volcanics, volcanic ash, and even metamorphic rocks, found in Wellega Kaffa, Illuababora Most highlands.
Acrisols	mostly at high rainfall highlands areas	lost most nutrients low productive capacity	Infertile because inherently & organically degraded chemically	found along with nitosols in southwestern
Vertisols	highlands and moderate climates	swelling when wet and cracks when dry. heavy clay soils	has very high natural chemical fertility. But easily degraded	develop from volcanic, basalt, pyroclastic, sedimentary rocks, colluvial and alluvial plains. Gojjam, Shewa, Arsi, Bale and central Hararghe).
Lithosols, Cambisols & Regosol		young, shallow and coarse textured, low water holding capacity		found in rugged topography and steep slopes, Central Highlands, Rift Valley, Hararg, Danakil and eastern Ogaden

Soil	Environmental condition	Characteristic	Agricultural suitability	Occurrence
Xerosols	subjected to wind erosion, deserts soil, available in arid and semiarid areas	high salt content and low organic content	very fertile if irrigated poor humus & nitrogen, rich in phosphorus and potash	Ogaden and northeastern escarpments
Yermosols and Solanchaks	available in arid and semiarid areas		drier and more problematic than Xerosols	located in salty plains of Afar, especially Solonchaks in Afar salty plains
Fluvisols		recent alluvial deposits in depressions	flat or nearly flat ground, fertile for large-scale irrigation	Omo, Awash, Abay Akobo, Baro, Rift Valley
Luvisols	Develop by alternative of wet and dry seasons	not leaching	good chemical nutrients, best agricultural, intensively cultivated	steep slopes & flat top Lake Tana area, Parts of Northern, Central, Eastern Highlands & Southern lowlands.

6.2.2. Soil Degradation

- change in any or all of soil status or diminished the capacity or deterioration of any physical, chemical and biological properties of soil.
- There are three major types of soil degradation:

i. Physical Degradation:

- deterioration of the physical properties of soil.

a)Compaction: elimination or reduction of structural pores of soil that accelerated runoff and erosion.

b)Soil erosion: The process of wearing away and moving down of soil components due to erosion, leaching and others agents of erosion.

- Ti has three-phase process. **detachment** of individual soil particles, **transportation** and **deposition**.

ii. Biological Degradation

- Reduction in soil organic content, decline in biomass carbon and decrease the activity and diversity of soil fauna,

iii. Chemical Degradation

- Nutrient depletion, excessive leaching, decline in soil pH and a reduction in base saturation.

causes of soil erosion in Ethiopia.

1.Physical Causes:

-Steepness slope,, intensity, duration and seasonal of rain, texture, types and composition of soil, plant cover etc.

2. Human Causes:

•Deforestation, overgrazing, poor farming firing, cultivation, construction, building, mining, farm land expanding etc.

6.2.3. Soil Erosion Control Measures

- We have two major soil erosion control mechanisms.

A. Biological Control measures

- include vegetative strips, plantation, and reforestation.
- prevent splash erosion, reduces the velocity of surface runoff, increases surface roughness which reduces runoff and increases infiltration

B. Physical control measures

- Includes terracing, check dams, gabion, trenches, contour ploughing, soil bunds etc.

6.3. Natural Vegetation of Ethiopia

6.3.1. Introduction

- Natural Vegetation mean Plants grow with little or no human interference
- factors controlled the distribution of natural Vegetation are climate, soil types, drainage, elevation(slope), temperature and precipitation etc.
- Plants can provide shelter, food, source of fuel, pasture and grazing, raw material for industries, source of timber and non-timber products, moderating local climate, home of wild life, medicinal values, minimizing soil erosion etc.

- **xeromorphic plants:** plants which are adapted to drought and high temperatures
- **Afro-alpine plants:** plants which are adapted very cold and frost climate.

6.3.2. Major Natural Vegetation Types of Ethiopia

- Taking altitude into consideration natural vegetation can be classify into five groups:
  1. Afro-alpine and sub-afro alpine Region
  2. Forest Region
  3. Woodland Savannah Region
  4. Steppe Region
  5. Semi-desert Region

1. Afro-alpine and Sub-afro alpine Region

i. Afro-alpine

- Ethiopia has the largest extent of Afro-alpine and sub afro-alpine habitats in Africa
- Found between 4000 and 4,620 meters above sea level
- covers nearly 1.3% of the total landmass of Ethiopia.
- annul precipitation which ranges between 800 and 1,500 mm with sleet or snow and temperature records 0°c and negative.
- mostly shallow and eroded soils exist.
- Afro-alpine region consists dominantly tussock grasslands, scrub, scattered mosses and lichens etc.

ii. Sub-afro-alpine

- less extreme environment than the Afro-alpine
- Found between 3,300 and 4,000 meters
- Sub-afro alpine region is dominated by woodland, often degraded to scrub and wet grasslands with plants like Asta, giberra etc.

2. Forest Region

- predominantly trees are well known.

i. **Highland forests: include** Kosso, tid, kerkha, zigba, Weyra, keraro etc

ii. **lowland forests: like acacia trees**

iii. **Gallery (Riverine) Forests:** stretch along the banks of the lower courses of rivers e.g sholla

3. Woodland Savannah Region

- woodland savannah are known by their xeromorphic characteristics.
- broadly classified into three divisions:

i. Junipers Woodlands (tid):

ii. Acacia woodlands: grass grow with shrubs and Acacia trees (grar) and Konter.

iii. Mixed deciduous woodlands: grass mixed with deciduous trees (large leave drop during summer)

4. Steppe and Semi Desert Regions

- regions in the arid and semiarid parts of the country.
- where the temperature is very high and the rainfall is very low (100 to 550 mm for steppe and 50 to 300 mm for the semiarid)
- The Soils is alkaline and saline
- Xerophytic plants such as short shrubs, scattered tufts of grass species and a variety of acacias and palm trees are very common.

6.3.3. Degradation of Natural vegetation

- Over the past century, Ethiopia has dense forests coverage (40%) but it disappearing at an alarming rate for different reasons:
  - Clearing of forests for cultivation
  - Timber exploitation practices
  - Charcoal burning and cutting for fuel
  - Extensions of coffee and tea production areas
  - Overgrazing
  - Expansion of settlements both rural and urban and clearing for construction

6.3.2. Natural Vegetation Conservation

- three main approaches used for biodiversity conservation:

i.Protection:

- designation and management of the Protected areas include sanctuaries, national parks, and community conservation areas

ii.Sustainable forest management:

- involving sustainable harvesting of forest products to provide a source of financial income

iii.Restoration or rehabilitation:

- The process of recovery of a forest that has been degraded, damaged or destroyed.

6.4. Wild Life/wild animals in Ethiopia

6.4.1. Introduction

- Ethiopia has a unique fauna, flora, mammals, birds, reptiles, amphibians and a few groups of arthropods diversity with a high level of endemicity.

- Ethiopia has about:
  - 860 avian species (16 endemic species and two endemic genera),
  - 279 species of mammals (31 endemic species and six endemic genera),
  - 201 species of reptiles (14 endemic species),
  - 23 species of amphibians (23 endemic species)
  - 150 freshwater fish (6 endemic species).

- The wild animals in Ethiopia can be classified into five major groups:
  1) **Common wild animals:** (those animals that are found in many parts of the country (e.g. hyenas, jackals)
  2) **Game (lowland) animal:** include many herbivores like giraffes, wild asses, zebras etc and carnivores like lions, leopards, and cheetahs.
  3) **Tree climbing animals or arboreals:** (which include monkeys, baboons)
  4) **A variety of birds:** in the Rift Valley lakes
  5) **Rare animals:** gelada baboon, Semien fox, walia- ibex, Nyala.

6.4.2. Wildlife Conservation

- To prevent the destruction of wildlife, a total area of nearly 100,000 square kilometers found in Ethiopia.
  - ✓ 21 major national parks
  - ✓ 2 major wildlife sanctuaries,
  - ✓ 3 wildlife reserves,
  - ✓ 6 community conservation areas,
  - ✓ 2 wildlife rescue centres,
  - ✓ 22 controlled hunting areas,
  - ✓ 2 botanical gardens, and 3 biosphere reserves

The Importance of wildlife conservation are:

- for ecological importance, economic importance, investigatory importance, conservation of biological diversities etc.

- scientific and educational researches (valuable information for medical purposes and environmental studies)
- physical and mental recreation (aesthetic value)
- promotion of tourism (economic value)
- its potential for domestication
- maintaining ecological balance

- Ethiopia have different animals include buffaloes, zebras, lions, elephants, ostriches, giraffes, oryx, African wild asses, flamingos, pelicans, hippopotamus, crocodiles, Semien fox, gelada baboon, Nyala and Walia ibex.

6.4.3. Challenges of wildlife conservation in Ethiopia

- some of the major challenges are:
- Limited awareness on the importance of wild life
- Expansion of human settlement in protected areas.
- Conflict over resource
- Overgrazing (fodder and wood)
- Illegal wildlife trade
- Excessive hunting
- Tourism and recreational pressure
- Mining and construction material extraction
- Forest fire

CHAPTER SEVEN

POPULATION OF ETHIOPIA AND THE HORN

7.1. Introduction

- Human beings are producers and consumers of wealth from natural resources.
- Many disciplines like Geography, Demography, Economics, Epidemiology, Sociology and many more study about human population. Their differences lie in the methodologies and the aspects they emphasize
- Geography explaining regional/spatial differences on population distribution and densities, population numbers, human-environment interactions, population dynamics (fertility, mortality and migration), as well as population characteristics and qualities (age, sex, education and health composition etc.).

7.2. Population Data: Uses and Sources

- Regular and reliable population data are vital for socioeconomic development, planning and administration.
- data needed to plan such as schools, hospitals, roads, water, sewerage facilities, housing, establishing voting, district boundaries, estimating future tax revenue and designing public programs.
- demographic data are crucial to administrators, businessmen, researchers, academicians and planners.
- demography influences production, distribution, consumption, defense and administrative services at any administrative or natural unit considered.

- There are three conventional sources of population data

A. Census

- The total process of collecting, compiling and publishing demographic, economic and social data pertaining at a specified time to all persons in a defined territory.

Characteristics of census are:

- **Universality:** inclusion of all persons in a given area during the count.
- **Periodicity:** census undertaking at regular time intervals
- **Simultaneity:** undertaking census in a very limited time duration called the census day/night,
- **Government sponsorship:** an expensive endeavor and publication

procedures for collecting census data

- There are two procedures/ approaches

i. Dejure approach

i. it involves counting people according to their usual place of residence (where he/she lives most of the time).

ii. permanent population of an area making it suitable for planning and administrative purposes.

ii. Defacto approach:

– each individual is recorded at the place where he/she was found at the time of the census.

B. Sample Survey

- a method selected with the view that information acquired would represent the entire population.
- have the inherent weaknesses related to sampling errors and inadequate sources.
- This method is advantageous over census as costs, administer and taken much faster.

C. Vital Registration

- a system of continuous, permanent, compulsory and legal recording of the occurrence and the characteristics of vital events like births, deaths, marriages, divorces, and adoptions.
- more precise than census/sample survey because of time series data

7.3. Population Dynamics: Fertility, Mortality and Migration

Introduction

- Based on projected data from CSA, Ethiopia has an estimated 2019 population of 112 million
- a large and fast-growing population ranking 2nd in Africa after Nigeria and ranks 12th in the world
- the current growth rate is about 2.6%.
- 80% is rural based population
- 65 % of the population is below 24 years of age

7.3.1. Demographic Measurements

- In Ethiopia, fertility and mortality are the two principal determinants of population growth as international migration is insignificant.
- Some of the basic demographic measurements include:

A. Crude Birth Rate (CBR)

- The number of living birth from one 1000 people in a given years and a restricted region
- Example P= 70,686,000 B= 270,300
  - CBR?

$CBR = \frac{B}{P} XK$

- B → Birth
- P → Total population
- K → Constant (1000)

$$CBR = \frac{B}{P} k = \frac{270{,}300}{70{,}686{,}000} = 3.8/1000$$

B. General Fertility (GFR)

- The Number of living births in a year per 1000 women at a reproductive age
- **birth from specific age of women to number of women in the specific age group**

• GFR= k P1= population of women between 15-49 years ago.

. **Example:** P= 50,000,000 P1= 1/5 of total population

$$GFR = \frac{Total\ annual\ live\ birth}{Total\ women 15-49} x 1000$$

x 50,000,000 =

•

= 50/1000

C. Total Fertility Rate

- The average number of children that a woman would have at the end of her reproductive period
- 5 years female age specific birth from 15-49 is called cohort

TFR=(∑ASBR)5 o $TFR = 5x \sum_{n=1}^{7} \frac{Bi}{Wi}$ $ASBR = \frac{Bx}{px} x1000$

Where:-

- Bx a number of birth to a mother of x age group (15-19, 20-24, 25-29, 30-34, 35-39, 40-45)
- Px- women at age groups of from 15-49

D. Crude Death Rate (CDR)

- the number of deaths per 1000 population in a ye

$$CDR = \frac{D}{P} \times 100\%$$

E. Infant Mortality Rate (IMR)

- The number of infant death under age one per 1000 live births $IMR = \frac{D1}{B} \times 100$

F. Maternal Mortality Rate: death of mothers in connection from pregnancy and birth complications per hundred th

$$MMR = \frac{\text{Total annual maternal death due to birth complications}}{\text{Total live birth}} x\,100{,}0000$$

G. Life Expectancy at birth: the average number of years that a newly born baby is expected to live.

- **Natural Rate of Increase:** the difference between crude birth rate and crude death rate **NRI= CBR - CDR**

7.3.2. Levels and trends in Fertility and Mortality rates in Ethiopia

region	fertility	mortality	IMR	Life expectancy	SR
Country	4.6	4.4	54	62.6 years	99.96m/100f
Tigray	4.7	43	3rd highest		females dominants
Afar	5.5	36			male
Amhara	3.7	43			male
Oromia	5.4	45			male
Somalia	7.2	36	2nd least		Male
Benshangule		45	1st highest	47 years	male
Gambella	3.5	49	3rd least		male
SNNP	5.6	36	2nd highest	49 years	females dominants
Harari	4,3	36			male
Addis Ababa	1.8	18	least		females dominants
Dire Dawa	3.1	37			male
females	-	lowest		65.4 years	-
Males	-	highest		61.2 years	-
urban	2.3	lowest	48		females dominants
rural	5.2	highest	62		male

- Now in most developing countries, death rate declining but remain high birth rate due to:
  - —Little family planning practices and lack of population education
  - —Lower status of women
  - —Early marriage, particularly of females
  - —Parents consideration of children as assets
  - —The relatively high infant and child mortality rates that trigger couples to have more births to compensate for the loses
  - —Perhaps religious influences.

- Countries of the Horn of Africa have higher population growth rate that exceeds 2.6 %. Because of:
  - low per capita GNP
  - increased unemployment and under -employment
  - mounting social ills such as destitution, begging, theft, prostitution
  - continuous inflation that erodes purchasing power of the currency
  - shortage of cultivated land and food shortages
  - overcrowding of infrastructural and social facilities; housing problems and increase in urban slums and squatter settlements
  - Environmental problems such as deforestation, soil erosion, loss of biodiversity and pollution.

7.3.3. Migration in Ethiopia and the Horn

- mobility or movement of peoples permanent or semi-permanent change of residence between clearly defined geographic units

The implications of migration are:

- Migration yields an increased level of urbanization;
- It enhances rural-urban linkages in creating an integrated economy
- It influences spatial population distribution
- negatively influences human fertility and mortality patterns and levels and affects age and sex composition of the population.

- It is a means of achieving economic efficiency.
- cause and consequence of inequality and unequal development
- regarded as a cause and consequence of diversity and a mechanism of spreading cultures
- create the condition of strengthening, sense of nationhood and national unity
- Motivating to creativity and open to new ideas than a homogenous group of people.

A. Internal Migration in Ethiopia

- rural out migration during the Derg Regime was very low due to:
  - ✓ land to the tiller granted land to the rural landless farmers
  - ✓ Establishment of urban dwellers association and rural peasant associations
  - ✓ urban land nationalization discouraged migration
  - ✓ high level of urban unemployment and underemployment
  - ✓ Derg was also taking away the youth whoever in the city as soldiers to the warfront

- Now a day, the country has a relatively high level of internal migration 16.6% are labeled as migrant out of the total population.

B. International migration

- accelerated after the 1974 revolution
- Today, Ethiopia Ethiopian migrants are found in the Middle East, USA, Canada, Europe and African countries such as Sudan, Kenya, South Africa and Botswana.
- Diaspora estimated to be about 4,000,000. one of the countries that has a large number of emigrants from all African countries

- The causes of cross-border migration include:
  - Lack of employment and livelihood opportunities and negative attitudes attached with low paying and informal job and poor work ethics amongst the youth.
  - Rural underemployment and lack of resources
  - Unfavorable political context and insecurity,
  - Ethiopia's location and its long boundary that extends over 5,328 km which makes border management difficult
  - Existence of large number of local brokers with networks extending to destination countries
  - Misinformation and false promises by brokers/traffickers, family and peer pressure
  - Demand-side factors of migration (shortage of labour in low-paying, informal and perilous jobs, such as domestic work, construction, agriculture in destination countries)

- ILO identified migration source areas of Ethiopia
- **Dessie area:** Kemise, Bati, Kalu,Tehuledere, Haiq, Worebabo, Mersa, Dessie and Woldia
- **Shashemene area:** Shashemene-Zuria, Kofele, Kore and Assassa.
- **Jimma area:** Kaffa, Wolega and Iluababora, Dedo, Agaro, Setema, Sigmo, and Gomma
- **Mekelle/Tigray area:** Alamata, Kobo, Raya, Erob, Edagahamus, Gulomehadi, Etsebi, and Weneberta.
- **Other source areas:** Assela-Zuria, Adama-Zuria, Ambo, Fitche, Chancho, Hirna, Gelemso, Shewa Robit, Debre Birhan, and Debre Tabor

7.4. Age and Sex Structure of Ethiopian Population

1.Age structure (age ratio)

- Age Structure mean the distribution of population by age groups.
- age groups categorizing In every five-year (0-4, 5-9, 10-14, ..., 60-64, 65 and above). but, broadly used Age groups are three groups (0-14, 15-64, 65 and above).they known as young age, working age and old age respectively.

Measure of Age Stru

$$YDR = \frac{youth(15-64)}{old(>65)} \times 100$$

i.young to old ratio

- Ethiopia has heavy youth dependency ratio that bring serious problems and implication on socioeconomic development of the country. like;
  - Imposition of heavy burden on the working age
  - allocation of budget to food and other needs affect the investments and saving habits of the population.
  - diversion of limited resources on social services (schools, hospitals, medicines etc).
  - Burden to create expansion of employment opportunities for booming babies that require a job.
  - further promotion of high-level fertility by increased number of women entering to reproductive age (ages 15-49) annually.

ii. Age dependency ratio

- the young and old ages are dependent on the working age population.
- negatively affecting capital formation, investment and development in both

$$\text{ADR} = \frac{children(0-14) + older(>65)}{adult(15-64)} \times 100$$

iii.old age index

- old age population as the percentage of the working age population

2. Sex Structure (Sex Ratio)

- the ratio of male population to female

$$\text{SR} = \frac{\text{male}}{\text{female}} \times 100$$

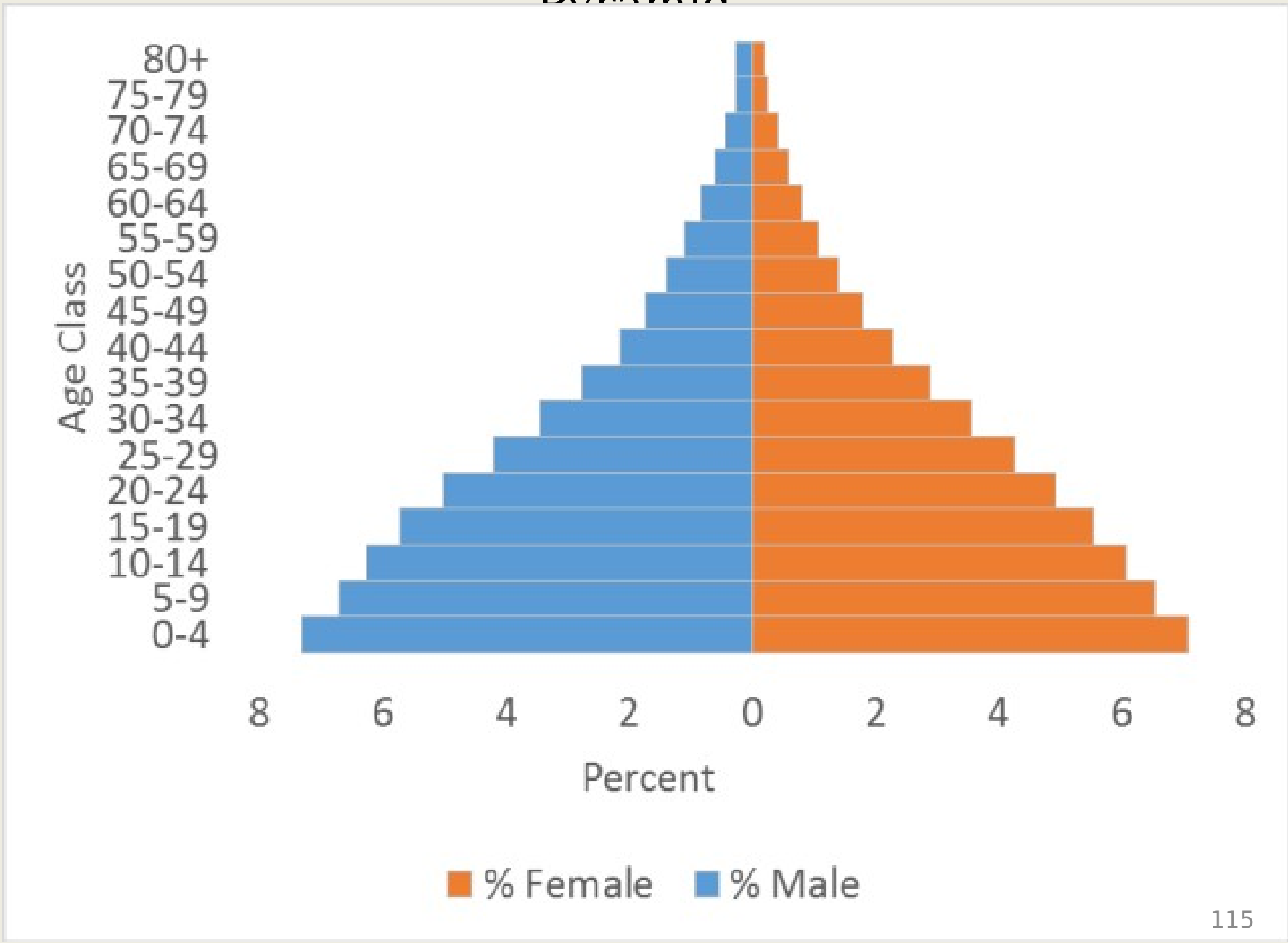
rent age groups.

- Sex ratios also vary with age
- At birth and young ages males tend to be greater in number but in reality greater number male children mortality in Ethiopia.

Population Pyramid (Dynamics) of Ethiopia

- A Graphical Illustration of Population Cases.
- It shows sex cohorts, age, number population dependency ratio, youngest, oldest and children population, developing or developed, fertility, mortality
- negatively affecting capital formation, investment and development
- seriously
- both household and national

The graphic Illustration of Ethiopian Population Pyramid



7.5. Population Distribution in Ethiopia

- the arrangement of people over space that is provided for them to settle and make a living through exploiting resources.
- physical factors that affect population distribution include climate, soil, vegetation, drainage and slope. the historical pattern of population movement, the type of economic activity, urbanization, industrialized and the demographic variables are same of them.

7.5.1. Measures of Population Distribution

Population Density

– the number of people per unit area.

a.Crud[illegible]tic density)

$$CD = \frac{\text{total population}}{\text{total area}} = \frac{TP}{TA}$$

- it does not show variations of population distribution in the uses of parcel of land.
- low density regions are Gambella, Somali, Afar and Benishangul-Gumuz.
- the largest population density regions are SNNP, Amhara, Harari.

- Wanago, Damot Gale, Aleta Wendo, Yirga Chefe, Dara, Kacha Bira, Angacha, Sodo Zuria, Shebedino and Kedida Gamela have crude densities exceeding 500 people/km2
- low densities areas are Guba,Gog, Vaso, Dolo Bay, and Liben less than 10 people/km2.

b.Physiological Density

- a ratio between total population and arable part of a country (estimated 969,630 km2)
- Eth

$$PD = \frac{total\ population\ (TP)}{total\ arable\ land\ area (TAL)}$$

siological density.

c. Agricultural rural density

- takes only agricultural population as a numerator and cultivated land as a denominator.
- in most developing countries there is not a significant difference between rural and agricultural population.
- It measures a better indication of the pressure of population on land resources.

$$Ad = \frac{\text{rural population}}{\text{cultivated land}} = \frac{RP}{CL}$$

- cultivated land and urban population are the two main factors makes variations in agricultural density

7.5.2. Factors Affecting Population Distribution in Ethiopia

- Both physical and human factors makes uneven population distribution in Ethiopia.

- **Regional Population Distribution**
  - Oromia, Amhara, SNNP are a major populated regions but Gambella and Harrar are a least populated regions.

i. Physical Factors

- Climate factors: mainly rainfall and temperature, and vegetation.
- other physical factors include drainage and slope, soil, attractiveness of a region etc.

ii. Human Factors

A. The historical pattern of population movement

- decline of the Axumite , establishiment of central highlands kingdom, northward movement of the Oromos population, a significant explanation of Amhara, Agew and Guraghe populations are some of examples.

B. Types of economic activities.

- pastoral herding, cultivated lands, the development of commercial farms, expansion of urban areas, industrial growths, transportation routes are some of the important elements for population re-distribution over time.

7.6. Socio-cultural Aspects of Ethiopian Population: Education, Health and Languages

7.6.1. Education

- It have gender parity, regional differences, urban-rural differences, age parity, infrastructural limitation & access differences, structure of educational system(primary, secondary, high school, TVT, collage and university) etc.

7.6.2. Health

- health in Ethiopia is related to potentially preventable, communicable diseases and nutritional disorders
- Ethiopia has poor health status

- **Some root causes for poor health status are:**
  1. Lack of access to clean water: rivers and lakes remain the most important sources of water
  2. Disease related to beliefs, behaviors and traditional practices which have a negative effect on health status include circumcision, early marriage, and low value of girls and children
  3. Lack of adequate nutrition:
  4. Lack of health services:

7.6.3. Languages Families and Languages of Ethiopia.

- Ethiopia is a country where about 80 languages are spoken most Languages belong to two Supper families.

A. Afro-Asiatic

1) **Cushitic:** largest number of speakers and the widest coverage. Oromigna, Somaligna, Sidamigna, Afarigna, Kembatigna, Hadiyigna, Alabigna, Gedeogna, and others.
2) **Semetic:** Amarigna, Tigrigna, Guragigna, Siltigna, Aderigna, and Argobigna.
3) **Omotic:** Wolaitigna, Gamogna, Kullogna, Kefigna, and Kontigna

B. Nilo Saharan

- It include Kunamigna, Bejigna, Gumuzigna, Maogna, Kewamigna, Nuerigna, Annukigna, and others.
- spoken in the western lowlands of Ethiopia along the border with Sudan.

7.7. Settlement Types and Patterns

7.7.1. Types of Settlement

Rural Settlement

- can be temporary or permanent depending on whether
- majority of the Ethiopian population still lives in rural settlements either hamlets or villages.

Temporary / Mobile Settlements

- most parts of the Rift Valley, peripheral areas, hot and dry mostly pastoral herding and mobile settlements. Because searching for new sites for water and grass.

Permanent Settlements

- where crop cultivation is practiced are permanent
- Permanent settlements are of two types
  1. scattered (diffused or dispersed)
  2. Clustered or Nucleated

7.7.2. Urban Settlements and Urbanization in Ethiopia

1.Urbanization is the process of society change or transformed from being rural economy, culture and lifestyle to being of urban.

2.Today, the urban population is about 20 %of the country's population.

- The major criteria used to classify settlements as urban in Ethiopia are:
  - i. Minimum of 2,000 people;
  - ii. Two-thirds of the population engaged in non-agricultural activities;
  - iii. Chartered municipality;
  - iv. The presence of social services and amenities

An overview of the History of Urbanization in Ethiopia

–Before Addis Ababa, only prominent urban centers were Axum, Lalibela and Gondar

–**Modern urbanization** associated with the establishment of Addis Ababa

–Ethiopia is regarded as a vast urban desert.

- different factors contributed to the growing and permanency of Addis Ababa
  - Introduction of the fast-growing Australian eucalyptus tree
  - Water supplies
  - Italian occupation and establishment of small-scale industries and institutions, road construction
  - The construction of roads and railway radiate from Addis Ababa
  - Introduction of modern schools, hospitals and health centers, hotels, cafes, bars, bakeries, butcher’s shops, cinema, post office, modern cathedrals, telephone and telegraph system, bank, printing press etc.

- low level of urbanization can be attributed to:
  - self-sufficiency of agriculture which reinforced rural peasant life
  - Low level of industrialization, low level structural transformation and economic development
  - morphology of the country hindered transportation and communication
  - continual warfare between kingdoms
  - and the frequent changes of the royal residence
  - Lack of employment and housing shortage in urban areas that discourage in migration
  - Political instability, ethnic conflict and social unrest during the late 1970s and 1980s.

- Now a day, urbanization process grows at faster rate in Ethiopia. Due to driving factors of urbanization:

– establishment, expansion and its permanency of Addis Ababa as a capital city

– Ethio-Djibouti railway line

– Italian occupation contributed to road building and small-scale industries

– Integration of the major administrative provincial with capital cities

– Political decentralization

– Proximity, agglomeration and metropolisation effects

- High Population density and growth rates
- New and large commercial farms, mining areas and agro-industries
- Sugar factories, mega projects, airports, highways and dry ports Opening of Universities and job opportunities,
- Tourism assets and attractions
- Development of border towns

Distribution of Urban Centers in Ethiopia

•The distribution of urban centers in Ethiopia shows spatial variation and hierarchy.

hierarchy of urban centers in Ethiopia

- ***Addis Ababa Metropolitan cluster :*** Addis Ababa and its surrounding towns.
- ***Secondary city clusters:***
- **Lake Tana Urban Cluster:** Bahir Dar, Gondar Debre Tabour, Debre Markos
- **South Rift Valley Urban Cluster:** Hawassa, Shashemene, Dila, Hosana, Sodo, Arba Minch
- **Eastern Urban Cluster:** Dire Dawa, Harar, Jigjiga
- **Mekelle Urban Cluster:** Mekelle, Adigrat, Shire, Axum
- **Dessie- Kombolcha Urban Cluster:**
- **Jima Urban Cluster:** Jima, Agaro, Mizan, Tepi, Gambella

Tertiary urban clusters

- **Nekemte Urban Cluster**:Nekemte, Dembidolo, Gimbi, Metu, Assosa
- **Gode - Kebri Dar** city network
- **Semera-Mille, Asaita** city network

Growth Rate of Urban Centers

- Ethiopia's towns are characterized by wide range of growth rates . classified into three broad categories:

1)Declining Towns

- declining in absolute numbers because net out migration is greater than natural increase (EM>RNI)
- include, Axum, Goba and Maichew.

2. Slow Growing Towns

- grow at the rate which is less than the rate of natural increase (<RNI)
- such as Holeta, Harar and Gore are grow slowly in the recent past

3. Fast Growing Towns

- growth rates of greater than the natural rate of increase (>RNI)

CHAPTER EIGHT

ECONOMIC ACTIVITIES IN ETHIOPIA

8.1. Introduction

- Geographers classify a nation's economy into primary, secondary, tertiary(service sectors), quaternary and quinary.
- This categorization is seen as distance from the natural environment. It starts with the primary sector of an economy that extracts or harvests products from the earth.

i.primary sector (Red collar): include agriculture (subsistence and commercial), mining, forestry, farming, grazing, hunting and gathering, fishing and quarrying.

ii. **secondary sector (blue collar):** manufacture (finished & semi finished goods), construction & power production.

iii. **The tertiary sector:** service industry include retail and wholesale sales, transportation and distribution, entertainment, restaurants, clerical services, media, tourism, insurance, banking, healthcare, education and legal sectors.

iv. **Quaternary sectors (white collar):** Information, research, defense & top managements.

v. **Quinary sectors:** executive decision makers

8.2. Mining Activity in Ethiopia

8.2.1. Introduction

- Search and extraction of minerals from the crust of the earth
- Minerals are naturally occurring organic and inorganic substances.
- 1.5 % of GDP (USD 32 billion).

8.2.2. Status of the mineral sector investment in Ethiopia

- The Mining laws of Ethiopia have been issued in 1993 and amended recently.
- The mining stakes in Ethiopia are held by a Government organization named as National Mining Corporation EMDSC(2000) and a privately owned Ethiopian enterprise Midrock Gold work.
- Allana Potash a Canadian mining company start mining for potash in the Afar Regional and Indian Sainik Potash has been working in the Dallol depression.
- Presently a number of world class mining companies are operating in Ethiopia for different mineral commodities.

8.2.3. The importance of Mining sector in Ethiopia

1) Economic benefits

- Generates revenue from sales, taxes, royalty
  - federal government collecting 4.4 million USD from the large-scale production of gold every year
  - regional administrations also collect small scale production of precious minerals

2) Generates foreign currency earnings:

- 135 million dollars every year for the last couple of years from the sales of export of minerals such as gold, tantalite concentrate platinum, decorative dimension stones and gemstones
- Small employment opportunity in the sector because, mining is not a labour-intensive industry.
- several hundred thousand Artisana involve in mining works.

3) Social Benefits

- Expansion of infrastructures such as roads, electric power, telecommunication
- Expansion of social services such as health facilities, schools service, schools, water facilities for the local communities
- Train local communities to engage in other form of business
- Promote small entrepreneur’s engagement in the local community services such as hotel, mini- markets, stationeries

8.2.4. Environmental issues and management related to mining

- extraction of minerals leads to disturb the environment
- mining legislation is a compulsory criteria related to environmental issues.
- careful and systemic manage the surface and ground water, soil, rock stability, deforestation grass land, farm land, spillage chemicals or metals, air, noise, dust, aesthetic values of the area, cultural and tourist heritages
- licensees ensure based on mobilization of the environmental management and mine closure plan

8.3. Forestry

- related to exploiting forest products, which include gathering of fuel wood, production of timber and charcoal, and construction of houses.

Economic significance of forest

- contribution to the national economy (GDP)
- Fuel wood
- Timber household furniture
- For building and construction

•commercial exploitation of forest resources in Ethiopia is still in its infancy stage. Because:

- Rapid deforestation
- Low demand for timer
- Lack of modern lumbering technology
- Inaccessibility of natural forest

8.4. Fishery

8.4.1. Introduction

- involves harvesting of fish resources from water bodies.
- Fishing is known to be one of the oldest human activities.
- fishing is the most widely spread economic activity both in private and modern societies.
- Ethiopia has great potential for fishing.

Main Fish Speciesin Ethiopia are:

- Barbus, Clarius, Tilapia, Nile perch, Bagrus, Barbus Clarious, Labeo, Tilapia, Barbus, Nile perch, Bagrus, Barbus, Clarious,Cyprinus, Tilapia, barbus Clarious, Cyprinus, Tilapia, barbus Clarious, Tilapia, Barbus Clarious, etc

8.4.2. Fishing Grounds in Ethiopia

1.Lakes fishery

- Ethiopian lakes are estimated to cover a surface area of about 7000 km2
- include Lakes Tana, Ziway, Langano, Hawassa, Abaya and Chamo.
- Among the 101species of fish available in the country 25 of them are commercial fish species and are found in the lakes.

2.River Fishery

- Most rivers of Ethiopia have high fish resources. For example, river Baro

8.4.3. Demand and consumption of fish

- low level of local fish consumption
- fish has not been integrated into the diet of food.
- religious influences on consumption patterns, and demand for fish during fasting seasonal.
- limited supply of the product and its high price.
- distance of the fish production sites from densely populated areas and its perishability

- Socio-economic contribution of the fishery sector
  - Role of fisheries in the national economy: Gross Domestic Product
  - Trade: exports and imports significant amounts of fish
  - Food security: achieve food security for the growing population
  - Employment: considerable workforce is employed both directly and indirectly of capture fisheries
  - Fish meal as animal feed source: excellent source of protein and amino acids
  - Sport fishing as a recreational value: port fishing is common in southern part of Lake Tana.

8.4.4. Constraints and opportunities of the fishing sector

- Factories, agriculture and sewage are the sources of major pollutants affecting Ethiopian water bodies and their fisheries.
- Inadequate legal and policy frameworks
- limited human resource availability with an acute shortage of trained personnel.
- serious constraints on fishery management and technical and extension support services.
- Public and private investment in fishery and aquaculture is low and inadequate infrastructure
- Traditional methods of fishing
- Low transportation & facilitating services

8.5. Agriculture in Ethiopia

8.5.1. Introduction

- Cultivating of crop and rearing of animals for local consumption or commercial porpuse.
- The sector is dominated by small-scale farmers that practice rain-fed mixed farming by employing traditional technology, adopting a low input and low output production system.
- majority of the poor reside engage in this sector.

8.5.2. Contributions, potentials and characteristics of agriculture in Ethiopia

- The contributions of agriculture in Ethiopia
  - accounts for GDP
  - foreign exchange earnings
  - derives its livelihood directly from agriculture
  - provides raw materials for the processing industries
- **The Agricultural Resource Base/potentials of Ethiopia**
  - abundant agricultural resource and varied agro-ecological zones
  - has also vast grazing land and livestock population standing first in Africa and 10th in the world

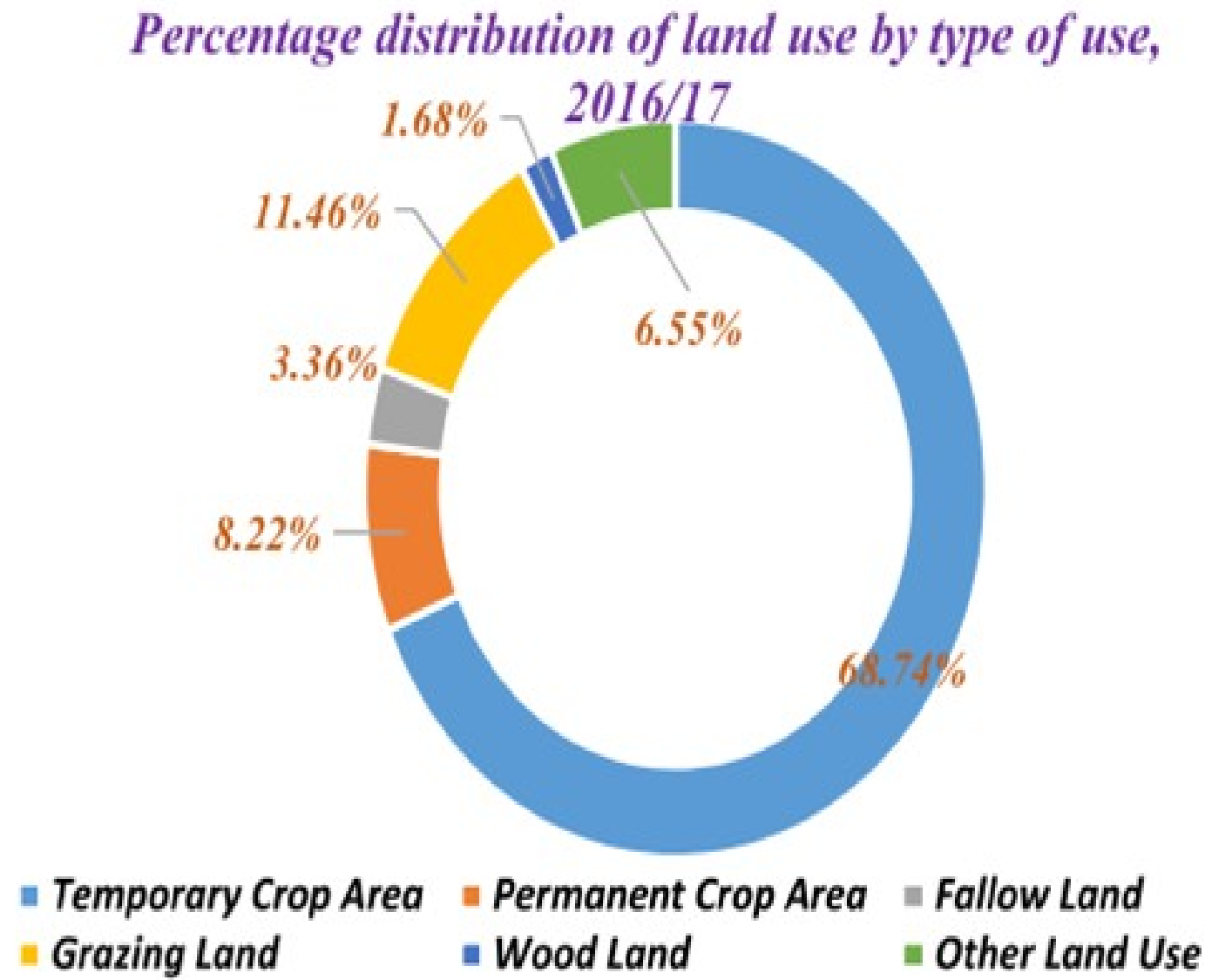
Land Use in Ethiopia

- Ethiopia has a total land area of about 113,000,000 hectares
- 12.6 million hectares moderately cultivated,
- 12.5%) of the total area is intensively cultivated,
- 6.9%, forest and wood land, 30.5% grassland
- lowland areas and river basins are more suitable for irrigation.

Agricultural Land Use in Ethiopia

- Land resource highly dependent on agriculture. Because:
  - Agriculture is a land-based activity
  - Quality of land direct bearing on the productivity of agriculture

- Agricultural land refers to the share of land area that is arable under **permanent crops** and under **permanent pastures**.
- **permanent crops:** includes land under flowering shrubs, fruit trees, nut trees, and vines, but excludes land under trees grown for wood or timber.
- **permanent pastures:** Permanent pasture is land used for five or more years for forage, including natural and cultivated crops.


Percentage distribution of land use by type of use, 2016/17
1.68%
11.46%
6.55%
3.36%
8.22%
68.74%
Temporary Crop Area
Permanent Crop Area
Fallow Land
Grazing Land
Wood Land
Other Land Use

Cropping seasons & Cropping Pattern in Ethiopia

- There are two main crop seasons in Ethiopia.

- **Belg crop season**
  - is officially crop harvested between March and August.
  - the main season and produces 90-95%.
- **Meher crop season**
  - is crop harvested between September and February.
  - provides the remaining 5-10%

- **NB: Cropping Pattern & quantities of production of cereals (teff, wheat, barley, maize, sorghum, etc are vary from place to place and time time due to different factors.**

Animal Husbandry

- About 75% of the cattle and sheep population are found in the highland zone while
- 70 % of the goat and 100% of the camel population are found in the lowlands. than
- 90% of the livestock population is found in Oromia, Amhara and SNNPR.

Characteristics of Ethiopian Agriculture

1) Subsistence Orientation
2) Fragmentation of farm and Small size of Holdings
3) Low Use of Inputs
4) Susceptibility to Disasters
5) Limited practice of irrigation & dependent on rain-fed

8.5.3. Agriculture Systems in Ethiopia

8.5.3. Agriculture Systems in Ethiopia

- Agricultural system is terms of similar resource basis, enterprise patterns, household livelihood, constraints, could have similar development strategies, interventions and also share more related socio-cultural, economic and livelihood structures and patterns.
- The agricultural systems of Ethiopia can be classified based on:

1. The Agro-ecological patterns
2. Dominant types of crops or animals
3. Farming methods and tools used
4. Level of technological input & disposal of output

- Based on the dominant corps cultivated or animals reared and the main implements used in cultivation, the major farming systems are classified as:
  1) Highland mixed farming system
  2) Lowland mixed farming system
  3) Pastoral system
  4) Shifting cultivation
  5) Commercial agriculture

1. Highland mixed farming system

- areas of over 1500m.a.s.1 in dega woina dega agro-ecological zones.

A. Grain-plough complex

- Grain-plough is an integration of crop and livestock production with a complex farming activity.
- Farmers mainly depend on cereals crops (Barley and wheat, teff) with pulses and oil crops for subsistence.

B. The Horticulture-Hoe complex

- Like: Cash crop, fruits, horti-plants & hoe/cattel
- This agricultural system is primarily found in the high rainfall humid regions of southern and southwestern parts
- The major crops grown include enset, coffee, chat and various other horticultural corps.
- Maize is the major cereal crop in the region Grown both wood and fruit-trees using multiple cropping methods with coffee, Chat and Enset is known as inter-mixed Agro-forestry farming system .
- Livestock, mostly cattle are an integral part of horticulture hoe system

2. Lowland mixed agriculture

- common in the hot and dry mountain foothills, Rift Valley and northern areas of Awash River
- Grown the varieties of sorghum, maize, wheat, teff, oil corps and lowland pulses mixed with Livestock raised.

3. Pastoral complex

- practiced in the arid and semiarid lowlands of Ethiopia.
- Afar, Somali, Borena, lowlands of Omo and Lake Turkana area.
- Cattle, camels, sheep and goats are important animals
- Almost all the camels, ¾ of goats, ¼ of sheep, 20% of cattle are raised by pastoral communities.
- About 90% of the live animals exported from areas.

4. Shifting cultivation

- This is the cut-burn cultivation system because, clearing the plot until its natural fertility is exhausted
- Practice in Benishangul-Gumuz, Gambella and Southern Regions but now a time, it is decline due to government intervention and sedentary farming introduced (villagization).
- livestock rearing is limited in this areas due to tsetsefly infestation

5. Commercial agriculture

- modern farming practice involving the production of crops or animal for market using mechanization and hired laborers.
- Mechanized farms were concentrated in the Awash valley, Arsi, southern Shoa and Humera-Metema
- the main problem are lack of infrastructure, access to land, conflicts with local inhabitants, hot and disease ridden areas

8.5.4. Major problems of Ethiopian agriculture

1) Land degradation
2) Variable rainfall
3) Land fragmentation
4) Land tenure insecurity
5) Backward technology
6) Poor rural infrastructure

8.6. Manufacturing Industry in Ethiopia

8.6.1. Introduction

– a higher-level economic activity than the production of primary materials.

Employment in Industries

- The number of persons engaged in machinery and equipment grew tremendously.
  1. micro enterprises employ
  2. small enterprises employ
  3. medium enterprises employ
  4. and large enterprises employ

The value of industrial production

- The Ethiopian large and medium size manufacturing sector is dominated by food and beverages.
- It accounted the largest proportion of the overall manufacturing value added

8.6.2. Types and characteristics of manufacturing

Types of Manufacturing Industries

a)The Cottage (traditional)industries

- various kinds of weaving, woodcarving, pottery, metal works, basketry etc. are known for a long time.
- most important factor for the development of cottage industries are:
- negative traditional attitudes towards such activities, considered of low social cast activities and limited availability (minerals, market, agricultural raw materials and sources of power)

b) Manufacturing Industries

- In Ethiopia manufacturing industries are at a low level of development

i. light industries

- process consumer goods like textiles, food, tobacco etc. Heavy industries that manufacture capital goods are very small

ii. Heave industries

- Bulk machinery and construction materials handle in large quantity and produced large quantity. E.g chemical, vehicles, air craft etc industries.

Top 10 towns 2009/10		
Top 10 towns	Share (%)	Employment
Addis Ababa	40.3	45.9
Hawassa	3.6	2.5
Dire Dawa	2.8	1.9
Mekelle	2.8	1.9
Adama*	2.4	3.1
Bahr Dar	2.3	1.4
Bisheftu*	1.7	2.5
Sebeta*	1.7	1.5
Burayu*	1.6	1.3
Hosana	1.1	0.3

Industrial parks/zones in Ethiopia

- To day, Ethiopia gives top priority for manufacturing industrial development that established different industrial parks across the country. Why becuase:
  - strong linkages with the agricultural sector
  - labour intensive
  - Have export potential and low entry barriers

Three mechanisms place for the establishment of IPs/SEZs:

a) fully developed by the federal or regional government;
b) developed by PPPs with the IPDC and
c) by private developers only.

- Industrial parks in Ethiopia can also be categorized based on their focus sector:

1) Textile and garment;
2) Leather and shoes
3) Agro-processing,
4) Pharmaceutical and IT park.

Contributions of Industrial Parks in Ethiopia

- Stimulating investment and creating employment
- Facilitating export growth and foreign exchange earnings
- Developing industrial clusters through forward/backward linkages
- Eliciting knowledge transfer and technology spill over
- Establishing connections to global value chain
- Fostering Sustainable Growth and social equality
- Enforcing implementation of national industrialization strategy

The Sugar Sector Mega Projects in Ethiopia

- The country has huge labor and resources like water, suitable climate and ideal landscape to expand this export-oriented manufacturing industry.
- It also has more than 500 thousand hectares of irrigable land suitable for the sector.
- Wonji and Metehara) have limited capacity to meet domestic demand.
- Ethiopia is heavily investing in sugar plantations and factories like Omo-Kuraz Sugar Factory II, Kessem , Arjo Dediessa, Tendaho, Finchaa, Metehara, Wolqayet Sugar development project, Tana-belese Sugar Factory II etc

8.6.4. Industrial development in Ethiopia: Challenges and Opportunities

Challenges	Opportunities
High logistics and transportation cost	Relatively cheap electricity charge in comparison to
Limited research/study and action on export incentives	Macroeconomic stability and rapidly growing
Low labor productivity	Relatively cheap labor force & increasing number of
High cost of imported raw materials	Access to wide market (large domestic market,
Limited compliance to the international requirements	Competitive incentive packages which include
Underdeveloped rural infrastructure in the potential areas	Integrated Agro-Industrial Parks (one stop shopping for all the services, economies of scale,
Weak supply chain integration, market institutions and information system	Global attention due to its remarkable economic growth and credit worthiness
Low level of technology	

8.7. The Service Sector in Ethiopia

8.7.1. Introduction

- Tertiary economic activity involves the distribution and provision of goods and rendering services.
- include wholesale and retail outlets, banking and other financial services, governmental and educational services, medical facilities, and much other business and service functions upon which we depend daily. Security services, transportation, information and telecommunication services, tourism, health services, education institutions and research centers all are vital tertiary economic activities.

8.7.2. Transportation and communication in Ethiopia: types, roles and characteristics

8.7.2.1. Transportation

- persons, manufactured goods, and property are physically carried from one location to another
- There are five different types of transport in Ethiopia. These are:

a. Traditional Transport

- pack animals (donkeys, mules, horses, camel) and goods carried by humans.

b. Road Transport

i. Road Network

- The radial patterns of network development with the center being Addis Ababa
- the total road network increased rapidly

ii. Road Density

- The rugged terrain in Ethiopia makes road construction difficult and expensive
- compare the length of roads to the total area of the country

iii. Road accessibility

- annual average distance of all-weather roads or the proportion of area of all-weather

c. Railway

- Recently a new railway line connecting Addis Ababa to Djibouti
- it helps transport of bulky products
- The other important railway is Addis Ababa Light Rail Transit (north-south and east- west)

d. Waterways

- two types: **seaways** and **inland** waterways
- the port of Djibouti is very important for Ethiopia's external trade.
- Inland waterways are classified in to two **rivers** and **lakes**.
- Topography affect rivers flow
- like Baro and Omo and Tana and Abaya surve small-scale transportation

e. Airways

- Air transport is the fastest from the other
- reduced distances by minimizing the travel time.
- very essential for a country like Ethiopia, where the topography is difficult for communication
- expensive and cannot be used for transporting bulky products.

8.7.2.2. Communications

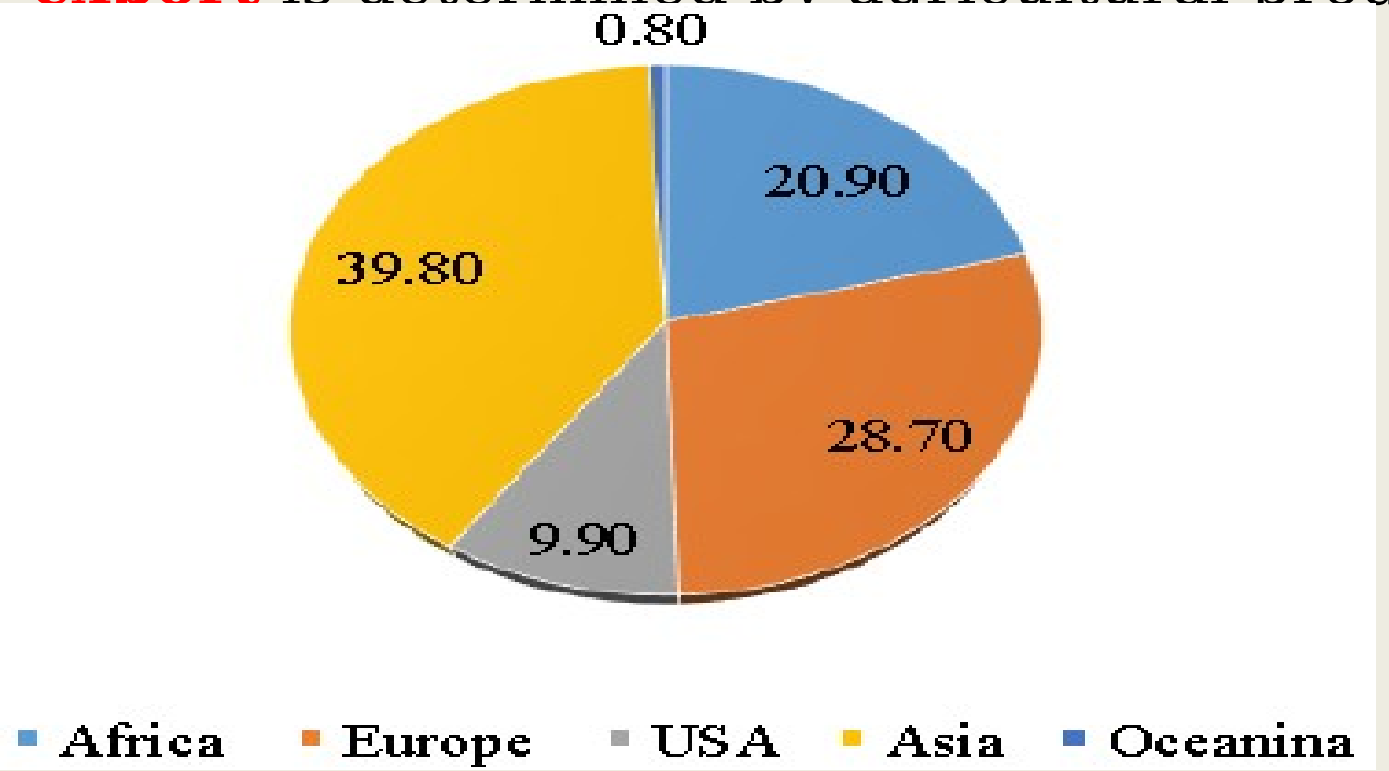
- the process of conveying messages to others
- include radio, television, internet, satellite, print
- publications, fixed and mobile telephones, and post offices

The Contribution of Transportation & communication

- It creates job opportunity
- It promotes investment opportunities
- plays a big role for both national and international trade.
- It serves as a source of income generation
- It contributes to the maintaining a country,s peace, political wellbeing and stability
- Plays the role of linking rural-rural interconnecting
- contribution to the development of tourism, entertainment, sports and peaceful relationship among people

8.7.3. Trade in Ethiopia

- Ethiopia has two types of trade. These are internal trade and external trade.
- Structure of Commodity Export of Ethiopia
- two types of trade. These are internal trade and external trade.
- **export** is determined by agricultural products.



Import

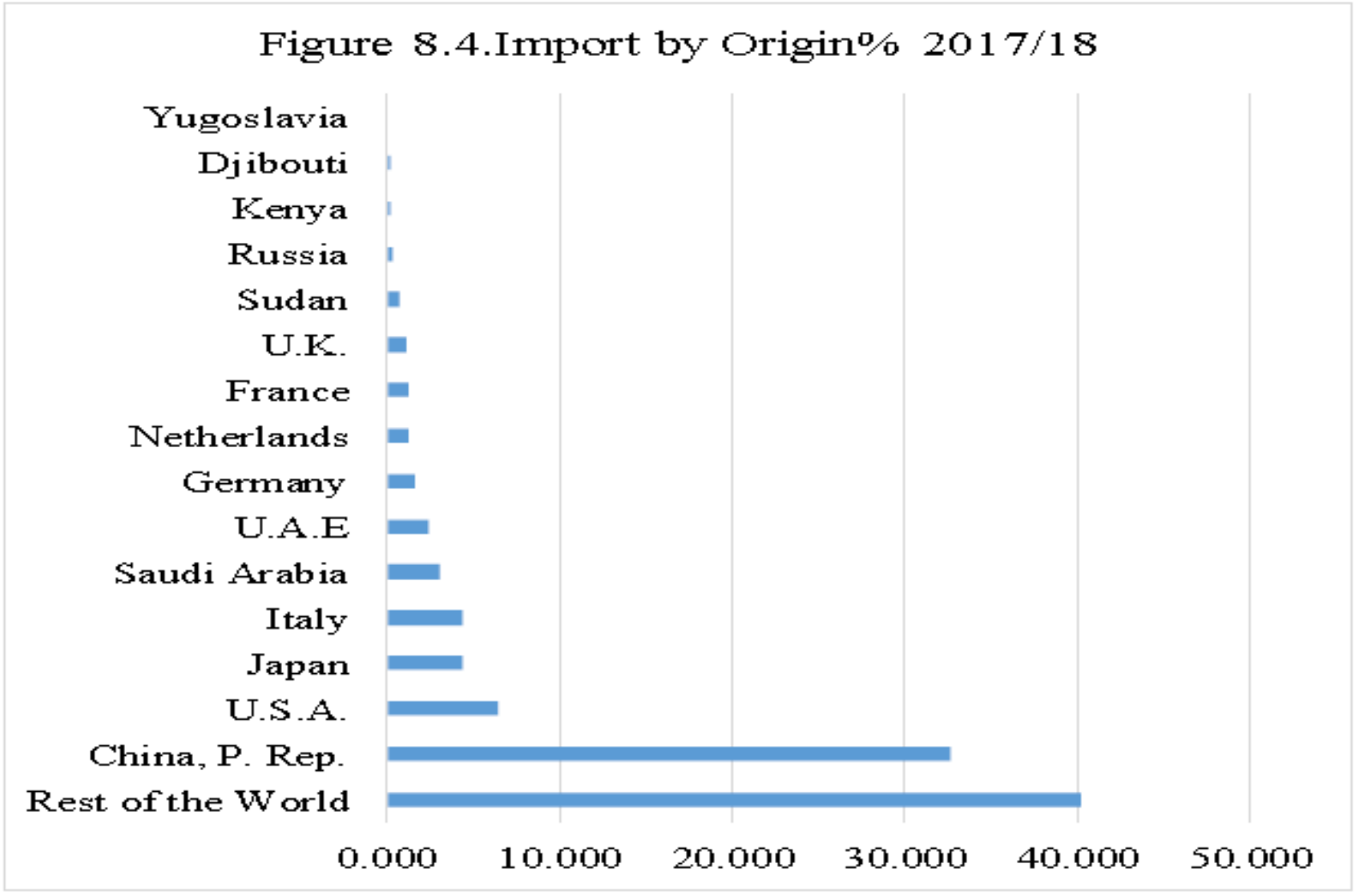


Figure 8.4.Import by Origin% 2017/18
Yugoslavia
Djibouti
Kenya
Russia
Sudan
U.K.
France
Netherlands
Germany
U.A.E
Saudi Arabia
Italy
Japan
U.S.A.
China, P. Rep.
Rest of the World
0.000
10.000
20.000
30.000
40.000
50.000

Particulars	2015/16	2016/17	2017/18
	%share	%share	%share
Coffee	25.2	30.4	29.5
Oilseeds	16.6	12.1	14.9
Leather and Leather products	4	3.9	4.7
Pulses	8.1	9.6	9.5
Meat & Meat Products	3.4	3.4	3.6
Fruits & Vegetables	1.9	1.9	2.2
Live Animals	5.2	2.3	2.2
Chat	9.2	9.4	9.3
Gold	10.1	7.2	3.5
Flower	7.9	7.5	8
Electricity	1.1	2.5	3
Others	7.4	9.7	9.7

The major export destinations for Ethiopian goods

1) Continental distination

- Asia accounted for 39.8 %
- Europe (28.7%)
- Other 20.9 %

2) individual country

- five countries (China, USA, Netherlands, Saudi Arabia and Djibouti) are important

8.7.4. Tourism in Ethiopia: Types, major tourist attraction sites, challenges and prospects

- the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes
- the contributions of tourism income to GDP as well as export earnings are growing in recent years.

Types of Tourism & attraction sites of Ethiopia

1. Historic Attraction sites
2. The Obelisk of Axum:
3. The Churches of Lalibela
4. The Castles of Gondar
5. The Walls of Harar
6. Natural Attraction sites
7. The Blue Nile Falls/ Tississat
8. Simien Mountains
9. The Rift Valley Lakes
10. The National Parks

The Role of Tourism in the Economy of Ethiopia

- the third source of export revenue after agriculture and industry.
- an important source of employment
- important economic sector in the country.

Challenges of the sector to be addressed

1. Weak institutional framework, skilled human and financing
2. Very limited capacity of international standards for leisure tourism with investment concentrated in main cities and hotels
3. Lack of basic and IT infrastructure
4. Weak private sector associations
5. Unplanned destination development
6. Poor visitor management in natural and heritage sites
7. Poor tourism statistics

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