GEOGRAPHY

TEACHER'S GUIDE

Grade 10

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FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
MINISTRY OF EDUCATION

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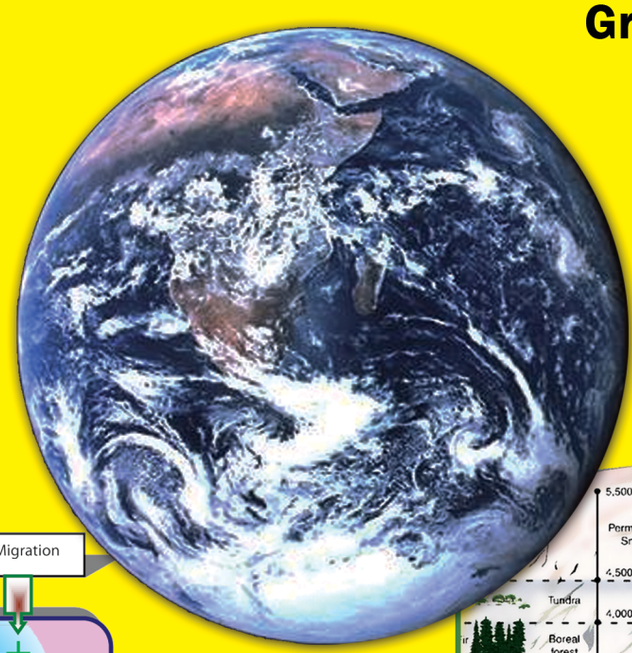

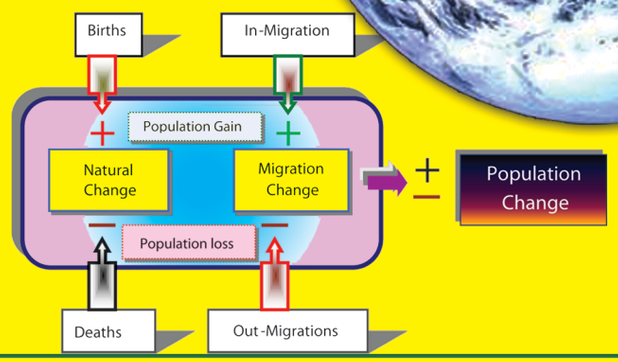

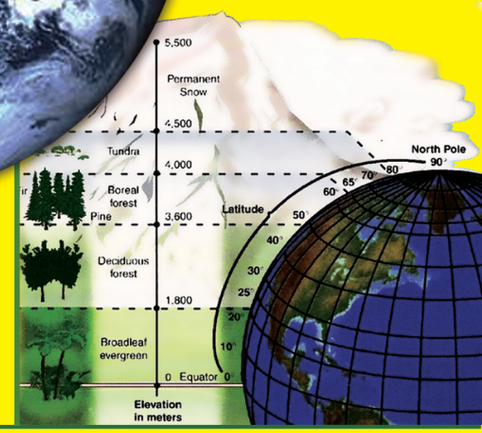

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GRADE 10

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INTRODUCTION

This teacher's guide of grade 10 geography is prepared based on the National curriculum to facilitate the instructional work of the teacher. It contains some important suggestions and instructions on how to present a lesson in unit and sub-units. It is designed to serve as a source material and provide basic teaching methods. It contains general as well as specific information on how to deal with the student text book.

It consists of four units, each with general and specific information designed to help you provide your students with minimum learning competencies. It is advisable to identify these minimum learning competencies and set out to create creative thinking, academic atmosphere and encourage active participation.

The aims of this guide are three-fold:

- to help teachers become aware of all aspects of grade 10 geography
- to promote good geographical practice in secondary schools
- to help teachers implement the National curriculum of geography.

Geography consists of knowledge and understanding of concepts and skills, all of which relate to the physical and human environment and the interactions between them. Geography is also an enquiry-based subject and any questions raised whilst teaching geography will be related to one of a number of major areas of enquiry.

There are seven major questions which are fundamental to students learning about geography.

- Where is this place?
- What is this place?
- Why is this place as it is?
- How is this place connected to other places?
- How is this place changing?
- How is this place similar to, or different from, another place?

In order to teach and learn about geography, it is good practice to bear in mind that these major questions work through major question approach and assist student build up an understanding of processes and places. It provides a framework of knowledge in which to develop major geographical concepts.

Major concepts of geography are:

- location and place
- spatial pattern
- process

- systems
- similarity and difference

Asking students major questions when they approach geographical work helps them progress towards the ultimate understanding of major geographical concepts

The final concept similarity and difference, relates to all the other aspects of geography. In learning about different places, patterns, processes and systems, students should be encouraged to compare and contrast so that they build up a more complex knowledge and understanding of place and spatial patterns and issues.

Progression, coherence and continuity in all these elements of secondary school geography are essential, whether the subject area is taught as an aspect of a broad topic or project, or as a specific subject in its own right. It also assumes that the teacher's management and organization skills are good enough to enable teaching and learning to take place in a variety of styles and so on.

Geography is a way of studying the world and its people as they are today. With good teaching practices, the obvious relevance and usefulness of the subject to the children should make it one of the more fascinating and motivating curricular areas.

Each unit in this guide is devoted to some selected instructional activities and organizational procedure. Generally, there are four elements that are basic for the lesson development, namely

i) introduction
ii) core lesson
iii) summary
v) evaluation

Every section of the guide and every topic of each section is composed of three basic concepts. In other words, various suggestions are given as to how to introduce a given unit topic, explain properly the core lesson using a variety of activities and learning skills and finally followed by evaluation which comprises additional questions and answers key for unit review.

Apart from the above stated consideration made in the construction of this guide book, an exemplary lesson is given at the end of unit one, the purpose of which is to provide the teacher with a sample plan in developing instructional lesson plan for each teaching topic. The teacher is supposes to divide and sub-divide the various units of the textbook into instructional topics and sub-topics and thus develop an instructional lesson plan according to the sample provided.

Some important sources and references are attached at the end of the teachers guide. Teachers are expected to use these sources and others for the intended teaching purpose whenever the lesson topic requires.

The guide is organized to help the geography teacher to be interactive and, moreover to motivate him/her, use his/her creativity and talent to make teaching geography in the classroom and in the field attractive and full of life.

General Information to the teacher

Albert Einstein believed that they awakened the "joy in creative expression and knowledge". **Elbert Hubbard** saw them as those who could make "two ideas grow where only one grew before". **Gail Godwin** surmised that they are "one-fourth preparation and three-fourths theatre". **Ralph waldo Emerson** believed that they could "make hard things easy". Whom are these talented geniuses talking about? You guessed it: teachers. Although these intellectual leaders shared an insight into the importance of teaching, even these artists and scientists could not decide on whether teaching was an art or a science, a gift or a learned skill. Perhaps it is both.

Some individuals seem to take to teaching quite naturally. With little or no preparation, they come to school with a talent to teach and touch the lives of students. Others bring fewer natural talents to the classroom yet, with preparation and practice, become master teachers, models, others try to emulate. Most of us fall in the middle, bringing some skills to teaching but also ready to benefit and grow from teacher preparation and practice teaching.

The following are some recent research findings on effective instruction, focusing on a core set of skills that comprise good teaching.

Academic Learning Time

Research shows that students who spend more time pursuing academic content achieve more. That's the common sense part and it's hardly surprising. What is startling is how differently teachers use their classroom time. For example, Teacher Evaluation study showed that some teachers spent 68 minutes a day on reading, where others spent 37 minutes; one elementary school teacher spent only 16 minutes per day, whereas another school teacher spent more than three times that amount. According to a research study, some schools devote approximately 65 percent of their time to instruction, whereas others devote almost 90 percent. The variation is enormous.

Allocating adequate time to academic content is obviously important. However, this alone is not enough. How this allocated time is used in the classroom is the real key to student achievement. To analyse the use of classroom time, researchers have developed the following terms: allocated time, engaged time, and academic learning time.

Allocated time is the time a teacher schedules for a subject for example, thirty minutes a day for math. The more time allocated for a subject, the higher student achievement in that subject is likely to be.

Engaged time is that part of allocated time in which students are actively involved in academic subject-matter (intently listening to a lecture, participating in class discussion, writing an essay, solving math problems). When students day-dream, doodle, write notes to each other, talk with their peers about non-academic topics, or simply wait for instructions, they are not involved in engaged time. When there is more engaged time within allocated time, student achievement increases. As with allocated time, the amount of time students are engaged with the subject matter varies enormously from teacher to teacher and from school to school. In some classes, engaged time is 50 percent; in others, it is more than 90 percent.

Academic learning time is engaged time with a high success rate. Many researchers suggest that students should get 70 to 80 per cent of the answers right when working with a teacher. When working independently, and without a teacher available to make corrections, the success rate should be even higher if students are to learn effectively. However, studies indicate that a high success rate is positively related to student achievement. How effectively teachers provide for and manage academic learning time in their classrooms is an important key in determining student achievement.

Clarity and Academic structure Have you ever been to a class where the teacher is bombarded with questions? What are we supposed to do? “Can you explain it again?” “What do you mean?” When such questions are constantly raised, it is a sure sign that the teacher is not setting the stage for instruction. Students need to have a clear understanding of what they are expected to learn; and they need motivation to learn it. Effective academic structure sets the stage for learning and occurs mainly at the beginning of the lesson. Although the specific structure will vary depending on the students’ backgrounds and the difficulty of the subject matter, an effective academic structure usually consists of:-

Objectives: Let the students know the objectives (or purpose) of each lesson. Students, like the teacher, need a road map of where they are going and why.

Review: Help students review prior learning before presenting new information. If there is confusion, reteach.

Motivation: Create an “anticipatory set” that motivates students to attend to the lesson. Consider throwing out an intriguing question, an anecdote, a joke, or a challenging riddle.

Transition: Provide connections to help students integrate old or new information.

Clarification: Break down a large body of information. Do not inundate students with too much information too fast. This is particularly true for young children and slower learners, although it also applies to older and faster learners.

Scaffolding: Step-by-step practice and well-crafted questions support and encourage student understanding.

Example: Give several examples and illustrations to explain main points and ideas.

Directions: Give directions distinctly and slowly. If students are confused about what they are supposed to do, repeat or break information into small segments.

Enthusiasm: Demonstrate personal enthusiasm for the academic content. Make it clear why the information is interesting and important.

Closure: Close the lesson with a brief review or summary. If students are able to provide the summary, so much the better, for it shows that they have really understood the lesson.

The major activity in academic structuring takes place at the beginning of the lesson. But there may be several points throughout the lesson where subtracting or brief presentations of information are also necessary. A clear summary or review is also important at the close of the lesson.

When teachers generate motivation and provide a clear introduction, all aspects of the lesson will proceed more smoothly.

Questioning

Good questioning is at the very core of good teaching. To question well is to teach well. In the skilful use of the question, more than anything else, lies the fine art of teaching; for it we have the guide to clear and vivid ideas, and the quick spur to imagination, the stimulus to thought, the incentive to action.

Since questioning is key in guiding learning, all students should have equal access to classroom questions and academic interaction. Yet, sitting in the same classroom taught by the same teacher, students experience significant differences in the number of questions they are asked. Research shows that male students are asked more questions than female students. One of the reasons boys get to answer questions as well as to talk more is that they are assertive in grabbing teacher attention. Boys are more likely than girls to call out the answers to the questions. In addition, when boys call out the answers to questions, teachers are likely to accept their responses. When girls call out the answers teachers often remind them to raise their hands. Teacher expectations also play a role and are frequently cited as one of the reasons that students (perceived as higher achievers) receive more questions and more active teacher attention than other students.

If you want all students, not just the quickest and most assertive, to answer questions, establish a protocol for participation. For example, make a rule that students must raise their hands and be called on before they may talk.

While the distribution and ownership of questions are important the type of question asked is also meaningful. This section provides more information about the different levels of classroom questions. Many educators differentiate between factual**, lower- order questions** and thought provoking**, higher-order questions**. Perhaps the most widely used system for determining the intellectual level of questions is the one which proceeds from the lowest level of questions, knowledge, to the highest levels, evaluation.

A lower-order question can be answered through memory and recall. For example, "what is the name of the largest river in Ethiopia?" is a lower-order question. Without consulting outside references, one could give the correct answer only by remembering previously learned information. Students either know the answer or they don't. Research indicates that 70 to 95 per cent of a teacher's questions are lower-order.

A higher-order question demands more thought and usually more time before students reach a response. These questions may ask for evaluations, comparisons, casual relationship, problem solving, or divergent, open-ended thinking. Following are examples of higher-order questions:

1. Is it possible that the population growth of Ethiopia may take stable pace within 10 years time? Agree/disagree. Why or why not?
2. Considering changes that have taken place in the past decade, describe the impact of computer technology on our daily life.
3. What could happen if our shadows came to life?

Variety in Process and Content

Variety is the spice of life, the saying goes-the spice of lessons also, because variety can enhance both teaching effectiveness and student achievement. Have you ever listened to a lecture for an hour and found your initial interest lapsing into day-dreams? Have you ever watched a class begin a seatwork assignment with active concentration and, after thirty minutes, found that involvement had turned into passing notes and throwing paper airplanes? When the teacher fails to provide sufficient variety, lessons become monotonous and students get off task.

Effective teachers provide **variety** in both content and process. In elementary schools, variety in content can involve moving from one subject area to another. In secondary instruction, the move might be in the same subject area, such as the switch from defining key words to analysing relationships in physical geography.

As any savvy teacher knows, student interest can be maintained by moving from one activity to another during a single lesson. For example, a 45 minute lesson on the soil types of Ethiopia might begin with a 10-minute overview providing the structure for the class, then move into a 15-minute question and answer lesson, then change to a 10-minute reading from the text and conclude with a 10-minute discussion and closure. Another motivation to vary content and process in teaching is to accommodate different student learning styles. Some students might miss what is said in a lecture (not being auditory learners), but easily get it when the teacher shows pictures (because the visual connection is clear). Following is a sampler of activities teachers can use to maintain student interest by varying the pattern of the lesson.

discussions	Guided practice	- brain-storming sessions
lectures	Student presentation	- cooperative learning activities
films, videos, DVDS.	Tests	- students tutoring one another
power point	Visits to websites	- cooperative learning activities
role plays	Silent reading	- students tutoring one another
simulations	Creative writing	
small-group activities	Field trips	
guest speakers		
independent seatwork		

Many of the activities listed above can be described as active learning and can be captivating for students, especially kinaesthetic learners, but more is needed. However, clear connections between the content and the activity must also be drawn, or learning can be lost. Consider a high school student happily pasting names of era on charts, yet unable to explain what (if anything) he is learning about geological time scale.

Models for Effective Instruction

Part of the challenge for teachers is knowing which model of instruction to choose for particular educational purposes. The following models differ dramatically from one another, yet each may find a productive use in your classroom.

i. Direct Teaching

Also called systematic, active, or explicit teaching, the **direct teaching** model emphasizes the importance of a structured lesson in which presentation of new information is followed by student practice and teacher feedback.

In this mode, the role of the teacher is that of a strong leader, one who structures the classroom and sequences subject matter to reflect a clear academic focus.

Researchers put forward six principles of direct-teaching. They witness that effective teachers use these principles consistently and systematically.

1. **Daily review** – At the beginning of the lesson, teachers review prior learning. Frequently, teachers focus on assigned homework, clarify points of confusion, and provide extra practice for facts and skills that need more attention.
2. **New material** – Teachers begin by letting students know the objectives to be attained. New information is broken down into smaller bits and is covered at a brisk pace. Teachers illustrate main points with concrete examples. Teachers ask questions frequently to check student understanding and to make sure that students are ready for independent work using new skills and knowledge.
3. **Guided practice** – Students use new skills and knowledge under direct teacher supervision. During guided practice, teachers ask many content questions such as ("What is plate tectonics)" and many process question such as ("What happens when two plates converge along convergence boundary?"). Teachers check student responses for understanding, offering prompts and providing corrective feedback. Guided practice continues until students answer with approximately 70 to 80 percent accuracy.
4. **Specific feedback** – Correct answers to questions are acknowledged so that students will understand when their work is accurate. When students answers are hesitant, the teacher provides process feedback ("Yes, Kidusan, that's correct because ---"). Teachers correct inaccurate responses immediately before errors become habitual. Frequent errors are signs that students are not ready for independent work, and guided practice should continue.
5. **Independent Practice** – this is similar to guided practice except that students work by themselves at their seats or at home. Independent practice continues until responses are assured and quick, and at a level of approximately 95 percent accuracy. Cooperative learning and student tutoring of one another are effective strategies during independent practice.
6. **Weekly and Monthly reviews** – Regular reviews offer students the opportunity for more practice, a strategy related to high achievement. Weekly review every Monday with a monthly review every fourth Monday is recommended. Direct teaching works well when you are teaching skill subjects or helping students master factual material. The direct teaching model is particularly helpful during the first stages of learning new and complex information. It is however, less helpful when imaginative responses and student creativity is called for.

II. Cooperative Learning

In a classroom using cooperative learning, students work on activities in small, heterogeneous groups and they often receive rewards or recognition based on the overall group performance. Sometimes, classrooms are set up to be less competitive incorporating independent study. In these cases, students work by themselves to reach individual learning goals. But a cooperative learning structure differs from even these less competitive practices, because students depend on one another and work together to reach shared goals.

According to researchers, cooperative learning groups work best when they meet the following criteria. Groups should be heterogeneous and, at least at the beginning, should be small, perhaps limited to two to six members. Since face-to-face interaction is important, the groups should be permit easy to permileasy conversation. Positive interedependence among group members can be fostered by a shared group goal, shared division of labour, and shared materials all contributing to a sense that the group sinks or swims together.

Cooperative learning techniques developed student team learning methods in which a team's work is not completed until all students on the team understand the material being studied. Rewards are earned only when the entire team achieves the goals set by the teacher. Students tutor one another so that everyone can succeed on individual quizzes and each member of the group is accountable for learning. Since students contribute to their teams by improving prior scores, it does not matter whether the student is a high, average, or low achiever. Increased achievement by individual student at any level contributes to the overall performance of the group, resulting in equal opportunity for success. Research shows that cooperative learning promotes both intellectual and emotional growth:

- Students make higher achievement gains.
- Students have higher levels of self – esteem and greater motivation to learn
- Students have a stronger sense that classmates have positive regard for one another.
- Understanding and cooperation among students from different ethnic back grounds are enhanced.
- Yet the practical realities of cooperative learning are not all commendable. Some students accustomed to starring roles in full class instruction, continue to dominate the small groups. Acurate grading requires an analysis of both the individual and group performance. Still as ability grouping becomes more controversial, educators are growing increasingly interested in cooperative learning as a strategy for working successfully with mixed – ability groups and diverse classroom populations.

III. Mastery Learning

Mastery learning programs require specific and carefully sequenced learning objectives. The first step is to identify a behavioral objective, a specific skill or academic task to be mastered. Students are taught the skill or material in the objective; then they are tested to determine whether the objective has been reached. Students who complete the test successfully go on for acceleration or enrichment, while the students who fail to demonstrate mastery of the objective receive corrective instruction and are retested. The success of mastery learning rests on the instructional alignment which is a close match between what is taught and what is tested.

In mastery learning, students typically work at their own pace, perhaps at a computer terminal or with individualized written materials. The teacher provides assistance and facilitates students efforts, but mastery still remains a student's responsibility. Since studies have shown that many students, particularly younger ones, find it hard to take charge of their own instruction, mastery learning programs high light the role of the teacher as instructional leader, motivator, and guide. Mastery learning is often geared to large groups, and it can benefit from technology, since computers and appropriate software can be particularly effective in self – paced mastery or skills and knowledge. It is beneficial for students especially in language, arts and social studies.

IV Problem - Based Learning

Problem - Based Learning (PBL) has been more successful in going beyond traditional subject – area boundaries. Focusing on authentic or real – life problems is at the heart of PBL and, as you might imagine, real problems are not bound by a single subject field or even by the school building. In this instructional model, a crucial aspect of the teachers role is to identify activities that fuel students interest such as:

- Design a plan for protecting a specific endangered species
- Formulate solutions that might have kept Ethiopia from plunging into civil war.
- How can we stop corruption?
- How can pollution in a local river or lake be checked, or even reversed?
- Develop a set of population policies to halve population increase in Ethiopia
- How can poverty and unemployment in Ethiopia be minimized?

Finding scintillating questions and projects to excite and motivate students is critical.

Student Centered Approaches are Best Because

- **Genuine Learning Originates With the Learner people.** They learn best what they want to learn, what they feel they should or need to learn. Students find lessons imposed "from above" to be mostly irrelevant, and the lessons are quickly forgotten.

- **They Best Preapre Students for The Information Age.** The knowledge explosion is actually a powerful argument for student-directed learning. Teachers can't possibly teach everything. We must equip students with research skills, then fan the flames of curiosity so that they will want to learn for themselves. Then students can navigate the information age, finding and evaluating new information.
- **Education Is A Vital And Organic Part of Society.** The most important lessons of life are found not on the pages of books or behind the walls of a school, but in the real world. Students need to work and learn directly in the community, from cleaning the environment to reducing violence.
- **Multiple Choice Tests Are Not An Olympic Event.** Education is not a competition and academic tests are not a new Olympic event where youngsters have to get the highest score to please the cheering crowd. National success will come from living up to our beliefs and working hard on the basis of knowledge, not by "dreaming" to live and act like other nations children.
- **Meaningful Rewards Do Not Come From Academic Competitions.** Grades, funny stickers, and social approval are poor sources of motivation. Authentic learning rests on a more solid foundation: intrinsic motivation. Real success comes from an inner drive, not from artificial reward. Schools need to develop students inner motivation and stress student cooperation, not competition.
- **Human Dignity Is Learned In Democratic Ccassrooms.** Democracy is learned through experience, not books; students flourish when they are respected; they are stifled when they are told what and how to think. As students manage their own learning, they master the most important lesson any school can teach: the importance of the individual's ideas.

The previous effective teaching part is organized in a way that it might assist your teaching activity providing a variety of research findings and established norms in teaching world. The following are suggested methods in teaching geography in high schools by applying student – centered learning approach that is strongly recommended in the national curriculum.

Methods Suitable For Teaching Concepts

A concept is a truth or generalization that must be perceived from specific observations and experiences. Perception are added to other perception unit a concept, a general picture or understanding in the mind of the learner, begins to emerge.

Methods of teaching a concept are essentially of influencing the observational and organizational powers of the youngsters so that they might perceive certain things. Since

perception and thinking are involved, many methods are appropriate in theory. In practice however, a teacher must decide which method is the most suitable for specific concepts. The evaluative criteria are:

1. Does the selected method speed up the learning process and make observation and thinking more efficient?
2. Does the selected method help students to apply the concept learned in a practical situation?

There are, however, different categories of concepts which led themselves to different methods of teaching. For example:

1. **Concepts about people** can be taught by using biographical books, historical books, case histories, visits, role – playing and personal incidents. Certain people can be observed directly. People who are not well known to the students can be made more real by using anecdotes and documentary films.
2. **Concepts about animals, plants and other living organisms** are best taught after observation of the organism by the learners. Visual aids are very helpful if direct inspection is impractical or impossible.
3. **Concepts about processes and principles** need to be demonstrated, observed directly, or pictured through analogy and example.
4. **Sensory concepts** must be taught by providing direct sensory experience.
5. **Spatial and dimensional concepts** can best be taught by using a combination of personal orientation and comparison.

In teaching a general concept, it is important to consider the following three phases which sometimes overlap (1) presentation (2) clarification and (3) application and integration.

All three phases are important in the first phase. The most important aspect is exposure and observation. In the second discussion, question and answer are most generally potent, and, in the third, it is important to identify elements of differentiation, integration, and abstraction and potentialities for application, problem solving and transfer.

1. **Text books and supplementary Reading -** In Ethiopia, schools text books and library books are in very short supply. If books are available, it is a valuable teaching method to require extensive student reading in subject materials being taught to a specific class. Well organized and up-to-date text books provide a means of self – directed study during free moments at school and after school.

   Whenever a single text book is used to serve a whole class, the teacher must expect some of the students to have difficult in reading the book because of the wide range of reading abilities found in most classrooms. However, reading the text book should not become the sole activity of learning. Textbook material should be used to stimulate pupils to challenge, question and learn from the content rather than to accept the content without thought.

2. **Lectures -** The word lecture is associated with the one – way – flow of words describing objects and events and related ideas. The lecture has been widely criticized as inappropriate for elementary and secondary schools. There are good reasons for limiting the use of certain forms of lecture. The modified, less formal forms – illustrated lectures, lecture demonstrations, reading aloud from resource materials for short periods, lecture with occasional student participation and informal brief explanations are all highly useful for specific purposes and not to be labelled as useless.

   In the formal lecture, it is the teacher who learns to use reference sources, to outline, to organize ideas to formulate conclusions, and to speak. The pupil who needs more practice in doing these very things, is able to practice only listening and possibly note taking.

   The lecture needs to be modified by combining it with the demonstration, the discussion and with audiovisual helps. Such combinations help the teacher to provide detail illustration analogy, and example to help give concepts and values real meaning.

3. **Demonstration -** By definition, a demonstration is directed toward showing some natural phenomena, a real object or process. It sometimes uses models and laboratory apparatus as the focal point. But, usually, there is first hand contact with a material thing (rock types) or processes involving real things. Thus, the sensory impact of the demonstration is very vivid and, it has therefore great value in teaching.

   There are many things which can help make the demonstration effective. Use of the chalk board, definitions of key words, printed instructions, questions calling attention to key points and, discussion can all contributes to good demonstration. Ideally, it is helpful if the room is arranged with demonstration table.

   Care should be taken by the teacher to keep the demonstration as simple as possible, to make the situation a natural one. Like the lecture, if the demonstration is too long and too involved and if it attempts to cover too much material, there is a danger of losing the attention of the students or of confusing them. If the purpose of the demonstration is to help pupils be able to do something later, then students should be allowed to try for themselves by practicing.

4. **Students Reports -** It has been observed that teachers frequently gain more actual benefit from class instruction than the students who remain in a more passive role. To reverse this situation, one such method is to assign students to give reports. A topic may also be assigned. But the learner himself is required to use reference sources, to organize ideas, and to talk before a group.

The best reports are where the pupil does not read his report nor does be memorize it. He uses brief notes in outline form and talks somewhat informally to the rest of the class. Teachers should usually require students giving oral reports to stand, face the class, speak clearly, use acceptable language, and complete the report within prescribed time limits.

Priority should be given to content and thoughtfulness rather than to speech techniques in evaluating it.

The atmosphere should be as related as possible and yet remain business like. Reports should be taken seriously. Joking and flippancy should be avoided. The teacher should require the class to listen attentively and take notes if appropriate.

5. **Resource visitors -** There are frequently a number of individual specialists in a community, especially in a large city center, who have knowledge and information that they would be willing to share with students upon invitation. Outside specialists who are invited into the classroom are called resource visitors. Effective teachers are aware of the instructional advantages to be gained by having selected resource person come to the classroom.

   In geography classes, a traveler who has just returned from the country being studied is able to give in up-to-date and personal account of what he has seen and heard. Such an account will be enthusiastically received by learners and impact their understanding only by actual first-hand experience on the part of the pupils themselves.

   In order that the most useful resource person be invited at the proper time in a unit study, the teacher should assemble a file of resource persons who are both willing and able to come to the classroom upon invitation. Most persons even those of national prominence will accept invitations if they think that students will benefit from their presentations.

   It is a good idea to assign students (on a rotating basis) to the responsibility of acting as official hosts during the visit of a resource person. Such an assignment gives the students the added advantage of meeting a new person, an interesting learning experience in itself. One of the host students should introduce the visitor to the class before he gives his presentation.

   Experiences with new and interesting people often serve as a great source of motivation for more students.

6. **Field Trips -** One of the first steps that can be taken in providing first hand contact with the teaching reference will be to exploit the local environment. A geography teacher may want to demonstrate erosion activity near the school grounds. The

biology teacher may want his class to visit the source of the local water supply or may plan a trip to gather different kinds of rocks to be found nearly.

If the trip is short and can be taken within the class time allowed, it is easily arranged. Most trips, however, involve special permission from the school director, absences from other classes and possible pre-arrangements at the destination. If the distance to be travelled is far away, then transportation and parental permission is required.

Because a long trip is expensive and bothersome, the objective should be clear and quite important to justify the trip at all. In most cases, field trips should be kept reasonably short. The field trip can be an excellent learning experience or it can be a great waste of time. It therefore needs careful planning and pre-arrangement on the teachers side. Finally, allow students to write a report in group about the field trip. The presentation can be done in the class-room in the following periods.

7. **Small Group Discussion -** Class discussion must be purposeful to be most effective. A class discussion must be about something relevant to the work of the course. It may revolve about question pertaining to a demonstration which the class has seen. It may center upon the text book presentation. It may follow a lecture by the teacher.

   Discussion is best served by a topic or problem which is discussible. When extremely factual information is involved, a discussion becomes a straight question and answer routine.

   Discussion is best concerned with clarifications, alternatives, comparisons, reasons why, and the application of facts and generalizations previously acquired. Usually to acquire new information is not its basic purpose.

   Discussion has the advantage of helping students to learn to function efficiently in a group setting – to learn how to contribute, how to listen, and how to asses arguments and counterarguments.

   Good class discussion needs effective leadership by the teacher for best results. The teacher must be tactful without dominating the group or stifling contributions from class members. He must spur the discussion when it lags behind by asking for comment from some pupil who has remained silent. The teacher cannot force his opinions on the group but he will be in a position to give them when they seem appropriate.

   Sometimes some questions or topics can be better discussed in smaller sized groups. After small group discussion, it is frequently desirable to follow up with

whole – class discussion or separate reports from each discussion group so that the entire class can share in the thinking of each sub-group.

8. **Question and Answer -** Questions can motivate and awaken the minds of students (see also questioning in general information)

   Provocative questioning helps youngsters observe discriminate and search for causes. An easy leading question, although it may produce a quick answer, gives pupils little opportunity for thought.

   The question which is directed at only a few students can be a waste of class time because it excludes other members of the class from the necessity of thinking.

   Probably even more important as far as clarification is concerned are the questions which the students ask their teacher. If these kinds of questions are not encouraged, there will be too much one – way communication and too little for two – way communication in the class. It is very important that students feel free

   to ask their teacher questions whenever they experience uncertainty or confusion.

9. **Brain-storming**

Advantages

- Listening exercise that allows creative thinking for new ideas
- Encourages full participation because all ideas are equally recorded
- Draws on groups knowledge and experience
- Spirit of cooperation is created
- One idea spark of other ideas

Preparation

- Teacher selected issues
- Teacher must be ready to intervene when the process is hopelessly bogged down

Disadvantages

- Can be unfocused
- Needs to be limited to 5 – 7 minutes
- Students may have difficulty getting away from known reality
- If not managed well, criticism and negative evaluation may occur
- Value to students depends in part on their maturity level

10. Case Studies

Advantages

- Develop analytic and problem solving skills
- Allows for exploration of solutions for complex issues
- Allows students to apply new knowledge and skill

Preparation

- Case must be clearly defined
- Case study must be prepared

Disadvantages

- Students may not see relevance to own solution
- Insufficient information can lead to inappropriate results
- Not appropriate for elementary level

11. Values Clarification

Advantages

- Opportunity to explore values and beliefs
- Allows students to discuss values in a safe environment
- Gives structure for discussion

Preparation

- Teacher must carefully prepare exercise
- Teacher must give clear instruction
- Teacher must prepare discussion questions

It is assumed that the following questions are common to all students regardless of their differences in attitude, knowledge and skill.

Therefore, the teacher is required to organize the class on the basis of the efficiency of students. The questions should be addressed in terms of the aggregate ability of the students in the group formed for fast, average and slow learners.

You can also refer to the assessment at the end of each unit in the syllabus and needs to stress on it while you are dealing with any activities.

Grade level learning outcomes for grade 10 Geography

After completing grade 10 the students will be able:

1. To develop understanding and acquire knowledge of:

- The use of magnetic compass
- Geographical grid origin of Ethiopia
- Methods of showing relief on maps
- The term contour lines and its properties as well as its difference from isolines
- Ways of showing specific heights on contour maps
- The term slope, its types, and gradient
- The concept of universe and the position of the earth in the solar system
- The origin and structure of the earth
- Geological time scale and major events in the world and in Ethiopia
- The concept of continental drift theory, components of the earth's physical environment and major components of lithosphere
- Term rock, its classification based on nature of rock formation and its distribution in Ethiopia
- The term soil, its types, formation and composition
- Causes and consequences of soil degradation as well as ways of soil conservation in Ethiopia
- The criteria used for classifying climate and climatic classification
- Causes of climatic change and its consequences
- Spatiotemporal variation of temperature in Ethiopia
- Rainfall distribution of Ethiopia and factors why Ethiopia experienced different climate from other tropical countries
- Climatic zones of Ethiopia
- Reasons for the occurrence of drought, and drought coping mechanisms
- The concept of ecosystem
- How climate affect the distribution of ecosystem, the effect of latitude on its distribution and factors that affect the diversity of fauna, and flora in the ecosystem
- Factors that affect soil characteristics in the ecosystem
- Population size of the world on continental bases and the leading populous countries of each continent
- Population growth trend, its doubling time, components of its change and population pyramid of developing and developed countries
- Factors that affect population distribution

- The causes and types of human migration
- The term urbanization, its level and factors that affect its process
- The spatial population distribution of Ethiopia
- The concept and types of economic systems
- The concept of sustainable economic development and its indicators
- World economic organization
- Concept of globalization, its advantages and disadvantages

2. To develop skills and abilities of:

- Finding direction on a map
- Showing the direction of a given place on a map
- Showing the position of places on maps
- Computing the scale of the enlarged or reduced map
- Enlarge or reduce map using pantograph or square method
- Calculating altitude of points between contour lines
- Computing the gradient of slope
- Calculating field distance
- Computing natural increase of population
- Computing population density and agricultural density based on a given data
- Showing demographic characteristics of the Ethiopian population
- Analyzing population structure of Ethiopia

3. To develop the habits and attitude of:

- Willingness to communicate people using maps
- Appreciation to the origin & structure of the earth
- Appreciation for varied climatic conditions experienced in Ethiopia
- Concern for environmental protection
- Developing positive thinking towards the implementation of family planning
- Realization of the population policy of Ethiopia
- Realization of the contribution of world economic organizations
- Sense of urgency towards the need for sustainable development
- Mental readiness of facing opportunities and challenges of globalization.

Unit 1 MAP READING

Total Periods Allotted: 21

1. Unit Introduction

In grade nine (9), students have learnt about, 'Introduction to the Concept of Map Reading", within which the basic uses of map, scale and classification of maps, among the others, were significant. Here in this specific unit they are supposed to learn about directions on map, location, maps enlargement, and reduction and relief features on maps.

Understanding maps is a very complex process. Many elements built up and brought together lead us to be able to make or read a map effectively. Practice of all kinds of preparatory concepts is needed before maps can be made. These skills are:

- Direction
- Location
- Distance
- Representation

2. Unit Outcomes

Upon the completion of this unit, students will be able to

- ➲ *Develop the skill of identifying direction;*
- ➲ *Measure distances on a map;*
- ➲ *Practice map enlargement and reduction;*
- ➲ *Understand the different ways of representing relief on maps.*

3. Main Contents

1.1 DIRECTIONS ON MAPS

1.2 POSITION ON MAPS

1.3 MAP ENLARGEMENT AND REDUCTION

1.4 RELIEF ON MAPS

1.1 DIRECTION ON MAPS

Periods Allotted: 3

1. Competencies

After learning this subunit, the students will be able to

- *Acquire the skill of finding direction on a map;*
- *Show direction of a given place on a map by means of compass direction and bearings;*
- *Explain the use of magnetic compass;*
- *Practice, how to find direction and bearings.*

2. Contents

1.1.1 Identification of direction

1.1.2 Measurement of Direction and Bearing

3. Overview

The science of direction goes back to man's earliest observations of nature, especially the stars and winds. Landmarks are also important aids to people who are travelling in a new environment. We also use maps and compasses to help us find our way around.

A compass is as indispensable as a pencil is to English and maths, but it is rare for it to be used as a matter of course. Magnetic compasses will be used as a matter of course. Magnetic compasses will be deflected from the north reading if near metal-for example a car, a metal bar under table. There are three different kinds of north. Magnetic north is the compass needle north, actually found to the west of polar or true north. Due to magnetic influences, magnetic north is always a variable number of degrees west of polar or true north. It changes every year and has no constant position.

Grid north is just 'paper' north, or the north we impose on a piece of paper when we put a grid over lay on it so that north to south is parallel to the side edges of the literal 'North pole' as on the globe.

4. Teaching-learning Processes

In this part of the teachers guide the overall process of the sub-unit lesson is discussed referring to suggested teaching aids and suggested teaching methods. In addition, the teacher class room activity while using the text book is also discussed in the presentation part of the process.

4.1 Suggested Teaching Aids and References

- A chart that shows compass points
- An ordinary compass/magnetic compass
- A globe
- Protractor, ruler and charts for measuring bearings

4.2 Suggested Teaching Methods

Questions and answers: You are supposed to ask questions and students will give answers and vice versa.

Explanation – Introduce the lesson.

Discussion – Help students to actively participate and share ideas and experiences

- Ask questions that bring such a situation so that they will be actively involved.

Demonstration – Bring teaching materials appropriate to the lesson as mentioned in the suggested teaching aids.

- Use the chalk board to indicate the four cardinal points and twelve subsidiary points and give their degree value.

4.3 Pre-lesson Preparation

- Get ready a wall chart that shows compass points.
- An ordinary compass.
- Make ready essential materials and tools suggested above as teaching aids.
- Find large-scale maps (like topographic map) suitable for measuring direction in all parts of Ethiopia.

4.4 Presentation of the Lesson

a) Introduction to the lesson

A teacher is expected to use his own method of presentation on the basis of the unique nature of the topic and the factors that govern the situation in class. However, it seems appropriate to introduce the lesson by raising questions related to the topic. Questions will motivate students and stimulate competition and assist them to share ideas among themselves.

- Let the students observe the chart that shows compass points.
- Invite them to focus on cardinal points.

To facilitate the discussion and sharing experience, ask students the following questions.

- What are some of the methods and expressions used to identify directions in your locality?
- How often do you use compass points to describe direction in your daily activities?
- Have you ever used a compass when you travelled out of your home town?

b) Body of the lesson

How do we identify and measure direction?

- Let the students draw Fig 1.1 and identify the four cardinal points and the points that are midway between cardinal points.

  How do we determine the direction of one point from the other?

- Make use of Figure 1.2 and discuss how to identify the direction of one point from another.
- Let the students extend the line through "A" and find the south direction.
- Next, let them draw a horizontal line through "A" and find the east and west directions.
- At this point, students will be able to identify the direction of 'B' from 'A' i.e, 'B' lies northeast of "A".
- Help them to find the direction of 'A' from 'B', following the same procedure.
- Make use of Figure 1.4 and discuss how we determine wind direction in relation to compass points.
- Note that the wind destination cannot be considered and cannot be used as a reference to name the wind.

  How do we measure direction and bearing?

  In the previous lesson, students became familiar with compass points and developed skills for identifying the direction of one point from the other.

- Define *bearing* and give them an explanation about the synonymous nature of *bearing* and *azimuth*.
- The terms are synonymous ordinarily, but strictly speaking, bearing and azimuth mean the same only up to 90^{o}. Then it's azimuth.

c) Stabilization

- We use North as a cardinal direction and measure all other bearings from it.
- Directions or bearing from one point to another are measured using compass points or directions in degrees and fractions of degrees clockwise from North.
- Geographic grid system is a method by which of a place can be given accurately using a grid composed of a network of **parallels** and the meridians.
- A national **grid** is a network of horizontal and vertical lines printed on the face of a map.
- The grid origin of Ethiopia lies in south – west most corner at the point in SW Kenya where the 34°, 30′E **meridian** crosses the equator (0°)
- Map enlargement is needed when one wants to show more details about that given area.
- When the scale of the map decreases, the size of the map also decreases accordingly.

4.5 Evaluation and Follow up

a) Evaluation

It is natural that there are slow learners and fast learners in any class room interaction. Therefore, you are supposed to entertain all of them according to their ability and difficulty of the lesson. You may ask questions to evaluate the outcome whether students achieve the skill that is intended to be gained or not.

b) Follow up

It is important to include activities and emphasize them in each lesson. They will create curiosity and motivate pupils' learning attitudes. You may produce your own exercises and activities, on the basis of your students, capacity, in addition to the exercises and activities provided in the text.

- Let the students work on questions given in activity 1.1, and 1.2.
- Help them read bearings using the compass in their school compound.

c) Additional Activities

A map depicts four localities. Locality 1 (2°N 34° 30′E), Locality 2 (2°N 35° 30′E), Locality 3 (2°S 35° 30′E) and Locality 4 (2°S 34° 30′E). Based on this information try to answer the following questions.

1. Locality 4 bears – degrees from locality 1
2. Locality 2 bears – degrees from locality 4
3. Locality 3 bears – degrees from locality 1
4. Locality 1 bears – degrees from locality 2
5. If the fifth locality bears 45 degrees from locality 3, locality 4 bears – degrees from the fifth locality.

4.6 Answer for Activities

Activity 1.1

1. Let students try and practice
2. North, East, South, West
3. An object that is easily seen from a distance
4. 32
5. 0^o = North, 180^o = South, 225^o = South west and 315^o = North West

Activity 1.2

Part II

1. North 2. SW
3. W = 270^o, SE = 135^o, NNE = 22.5^o and WNW = 292.5^o
4. a. SE b. NW c. ESE d. ENE e. WNW

Answers for additional activities

Given

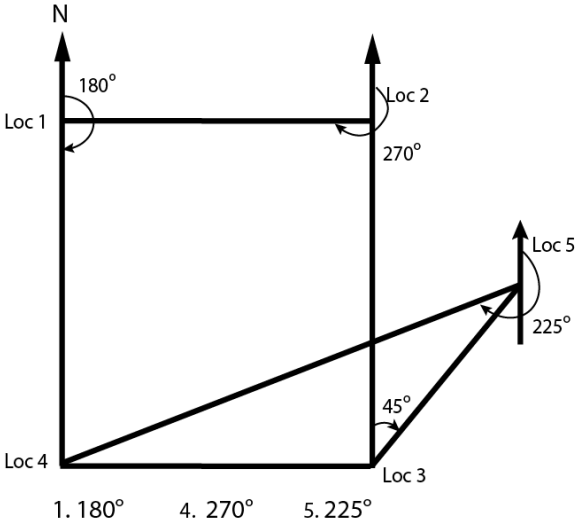
Loc. 1 (2^oN 34^o, 30′E)

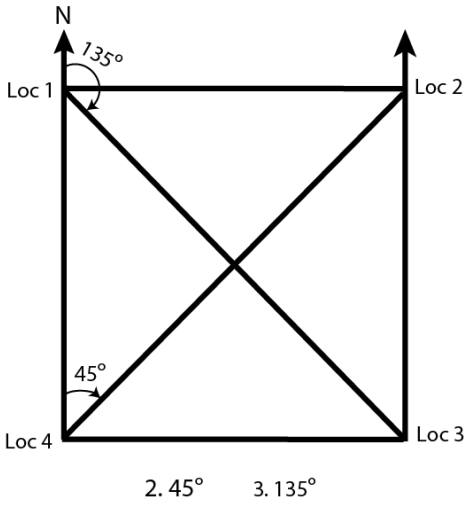
Loc. 2 (2^oN 35^o, 30′E)

Loc. 3 (2^oS 35^o, 30′E)

Loc. 4 (2^oS 34^o, 30′E)

Loc. 5 (bears 45^o from locality 3)





1.2 POSITION ON MAPS

Periods Allotted: 4

1. Competencies

Upon the completion of this sub-unit, the student will be able to:

- *Define what geographic grid system means;*
- *Demonstrate the position of a given place by means of geographic grid system;*
- *define what national grid system mean;*
- *Show the position of places on maps by using national grid reference (four and six digit grid reference);*
- *Demonstrate the national grid origin of Ethiopia;*
- *Enlarge and reduce maps using a square or pantograph method;*
- *Compute the scale of enlarged or reduced map.*

2. Content

1.2.1 Geographic grid

1.2.2 National gird

3. Overview

Mapping might be called "The science of whereabouts". A basic principle of this science is to take note of landmarks.

In order to know exactly where a place or thing is, we must know its position in space.

The most important ways of locating the positions and places on the earth's surface and on a map are the uses of latitude and longitude and national grid references.

Using latitude and longitude lines is the most important way of giving the position of or locating a place on a map. When locating positions, we always specify latitude before longitude.

For example: On a world map, Ethiopia is located between $3^{o}30$N and 14^{o} 52^{o}N latitude and 33^{o}E, 48^{o}E longitude.

National Grid reference – this method uses the vertical lines (Eastings) and the horizontal lines (Northings) drawn on maps. The verticals lines (eastings) are numbered eastwards from the national grid origin. The grid origin of Ethiopia is located at a point where the $34^{o}30^{o}$E longitude and the equator meet. The horizontal lines (northings) are numbered

northwards from the grid origin. The numbers along the top border of a map refer to the eastings. The number a along the left hand border refer to northings.

For Example: in 810^{ooo}, the 8 represents hundreds of kilometers (8 hundred kms). The 10 in large figure is the tenths and units of kilometers (1 × 10 + 0 = 10kms). Together they represent 810 kms. The ^{ooo} represents hundreds of meters. The eastings are numbered at every 1km interval like 348km, 350km etc,. The northings are also numbered at every 1km interval like 80km, 811km, 812kms etc.

4. Teaching-learning Processes

4.1 Suggested Teaching Aids and References

- political map of the world
- map of Africa
- Globe
- Large scale map of Ethiopia
- Chalk board sketches

4.2 Suggested Teaching Methods

- Explanation
- Discussion
- Exercise
- question and answer
- demonstration
- field study

4.3 Pre Lesson Preparation

- Get ready with political map of the world
- Map of Africa
- Globe
- Search for the appropriate teaching materials/aids suggested above
- Display a wall map appropriate enough for reading locations in the class room
- Inform students to read reference materials ahead of time.
- Organize a field study (See general information) based on the lesson requirement to observe and express the location of some important features.

4.4 Presentation of the Lesson

a) Introduction to the lesson

It is advisable to start the lesson with the following questions.

- What are the reasons that motivate us to know the position of places on the earth's surface?
- What are the methods that help us locate the position of a place on a map?
- What is *geographic grid reference*?
- What is *national grid reference*?

Let the students attempt the questions and share ideas.

b) Body of the lesson

While searching answers to the above questions, consider the following points:

- There are many reasons that push people to learn about the position of a given place.
- Some may be related to economy, political issues, culture, exploration etc.
- Discuss the four methods of indicating position on a map, namely:
  i. Position by using place names
  ii. Position by using direction and distance
  iii. Position by using *geographic grid reference*
  iv. Position by using *natural grid reference*

Geographic Grid Reference

- Let students recognize that geographic grid reference is the most nearly perfect method of indicating a position of a place on a map.
- Make use of a globe and demonstrate how the latitude and longitude lines are drawn on a map to create a network of coordinates which help to indicate the position of a place.
- Help them to draw latitudes and longitudes.
- Ask them to identify equator, prime meridiain, north and south poles.
- Make use of Figure 1.7, and 1.8 and demonstrate how latitude and longitude lines serve to indicate the position of a given point on the earth surface.
- Clarify the following concepts that are related to geographic grid reference.

- North and south poles mark the two ends of the earth's axis.
- The angle of latitude is measured north or south from the equator at the center of the earth.
- Longitude is an angular measurement east or west of zero line (0^o) – Greenwich Meridian at the centre of the earth.
- Help the students work on the activities given at the end of the lesson.

National Grid Reference System

- Discuss with students how and why the gird network system is organized.
- Let the students identify the difference between geographic grid and national grid system.
- From the map (fig 1.9), let the students learn about the grid origin of Ethiopia.
- By using the map (fig 1.10), help students to read and practice how to locate a place using a four digit grid reference.
- Make use of the map (fig 1.11) and demonstrate how to read the easting and northing values to indicate a position of a given point in terms of six digit grid reference.

c) Stabilization

- Geographic grid is a method by which the position of a place can be given accurately using a grid composed of a network of lines known as parallels and meridians such grid references are measured in ^{o}, "and ".
- A National grid is a network of horizontal and vertical lines printed on a map.
- Such gird system provides the position of any point in kilometers and fractions of kilometers east and north of the grid origin.

4.5 Evaluation and Follow up

a) Evaluation

- Let the students draw a globe and practice setting Latitude lines, longitude lines, the equator, Greenwich Meridian and write their respective values.

b) Follow up

- Help them to answer questions given on activity 1.3,1.4 and 1.5.
- Make use of Fig 1.11 and help them to answer questions indicated in activity 1.5.

c) Additional Activities

I. Answer the following questions

1. Identify the grid origin of Ethiopia.
2. What is your first step when you locate a point on a map using four digit grid reference?
3. What is the difference between four digit grid reference and six digit grid reference?
4. What is the initial latitudinal location of Ethiopia north of equator.
5. Which latitudinal line divide the earth equally into north and south hemisphere?

4.6 Answers for Activities

Activity 1.3

1. a. Addis Ababa b. Jerusalem c. New york d. Ras Dashen
2. a. 0 = 20^oS, 60^oE b. N = 20^oS, 45^oW
   c. C = 10^oN, 75^oW d. Lake = 30^o – 40^oN, 15^o – 30^oN

Activity 1.4

B = 6620 N = 7722

Activity 1.5

I. E = 637590 I = 631580

Answer Key for additional activities

Part I

1. $34^o34'E$
2. To locate the vertical grid line to the left of the point
3. Difference in accuracy
4. 3^oN
5. Equator

1.3 MAP ENLARGEMENT AND REDUCTION

Periods Allotted: 4

1. Competencies

Upon the completion of this sub-unit, the students will be able to:

- *develop a skill to enlarge and reduce a map using a square method and pantograph;*
- *compute the scale of an enlarged or reduced map;*
- *appreciate the need for map enlargement and reduction in certain circumstances.*

2. Contents

- Map enlargement and reduction

3. Overview

Map enlargement and reduction is a method that allows us to make a scale fit to the required objective.

We enlarge a map when we need to show more details about the area under investigation. We may reduce a map to be selective and to generalize the information that the map represents.

The two important methods discussed in our text are the square method and the use of pantograph.

4. Teaching-learning Process

4.1 Suggested Teaching Aids and References

- Map of Africa
- Map of Ethiopia
- Square paper
- Sample pantograph made of local material

4.2 Suggested Learning Methods

- Explanation
- Discussion
- Demonstration

4.3 Pre Lesson Preparation

- Get ready with map of Ethiopia
- Square paper of different sizes

4.4 Presentation of the Lesson

a) Introduction to the lesson

Let us start the lesson with the following question.

- Why do we enlarge and reduce the scale of a map?
- Let the students suggest what they think is the reason for enlargement and reduction.
- Ask them the difference between large scale maps and small scale maps.

b) Body of the lesson

- Give attention as to why we need to enlarge and reduce the scale of a map.
- Depending on the purpose, there is always a need to enlarge and reduce map scale.
- Explain the properties, advantages and short-comings of large and small scale maps.
- Discuss why and when we enlarge and reduce a map.
- Discuss the advantage of enlargement and reduction of map scale.
- Ask them whether they have seen the technological devices that assist the process of enlargement and reduction of map scale.
- Help them learn how to calculate the new scale using the formulae when enlarging or reducing a map.
- Introduce the square method and let the students practice the method based on fig 1.12 a and fig 1.12 b.
- Present the following steps to each student when applying a square method.
- Make use of fig 1.12 a and fig 1.12 b as a basis for your discussion.

1. Find the size of the original map.
2. Draw the frame of your map double (in the case of lake area) of the original map.
3. Cover the original map with ½ cm by ½ cm grid.
4. Cover your map under construction using 1cm by 1cm grid.
5. Using the grid as a guide, trace the major features.
6. Finally, use ink or color pencil for the different features and remove the grid lines from both maps.

- Discuss the use of pantograph and demonstrate its function.

c) Stabilization

- Map enlargement and reduction is derived by intended purpose followed by scale change
- An enlargement of a scale is appropriate to show more details on a map and reduction is done to generalize information.

4.5 Evaluation and Follow up

a) Evaluation

Ask them questions relevant to the topic give them exercises that require the application of a formula to enlarge and reduce a map scale.

b) Follow up

- Let the students work on activity 1.6 and practice how to enlarge and reduce map scale using the formulae.
- Ask them to bring square papers with various sides (1.2cm by 1/2cm and 1cm by 1cm sides) and let them work on activity 1.7 that is given in the text.
- Give them more exercises and follow their development in the following periods.

c) Additional Activities

I Answer the following questions

1. Enlarge the following map scales twice.

   A. 1:100,000 B. 1:50,000 C. 1:500,000

2. Reduce the following maps scales by half

   A. 1:100,000 B. 1:250,000 C. 1:10,000,000

3. When might it be helpful to use maps drawn at different scales?
4. A map with a scale of 1:100,000 is enlarged to 1:25,000. How many times is the scale enlarged?

4.6 Answers for Activities

Activity 1.6

1. a. 1:25000 b. 1:25000 c. 1:10,000,000 d. 1:2,5000,000
2. 4 times
3. a. 1:500,000 b. 1:2,500,000 c. 1:3,200,000
4. 3 times

Answer Key for additional activities

1. a. 1:50,000 b. 1:25,000 c. 1:250,000
2. a. 1:200,000 b. 1:500,000 c. 1:20,000,000
3. When there is a need to include a lot of details (in such a case a map cannot show a very big area)

   When there is a need to show less detail (a map can show a much larger area)

4. 4 times

1.4 RELIEF ON MAPS

Periods Allotted: 10

1. Competencies

Upon the completion of this sub-unit, the students will be able to:

- *describe methods of showing relief on maps;*
- *define the term contour line;*
- *discuss the properties of contour lines;*
- *distinguish contour lines and isolines;*
- *identify the different ways of showing specific height on contour map;*
- *compute the altitude of points between contour lines;*
- *explain the term slope;*
- *demonstrate types of slope;*
- *describe the term gradient of slope;*
- *compute gradient of slope;*
- *express gradient in different ways;*
- *calculate field distance.*

2. Content

1.4.1 Methods of Showing Relief on Maps

- Traditional methods of representing relief on map
- Contour as a modern methods of representing relief
- Properties of contours
- Methods of showing attitudes on contour maps

1.4.2 Slopes and gradient

1.4.3 Field distance

3. Overview

Through time, different attempts have been made to show relief on maps which are grouped as traditional and modern methods. Nowadays, contour lines are the most accurate and widely used means to represent various land forms on maps. To get the right information from contour maps, first you have to know the main properties of contour

lines. And then develop the skills of identifying different types of slope, calculating unknown heights, gradient and field distance.

4. Teaching-learning Process

4.1 Suggested teaching Aids

- Use the different figures included in the student text book. Additionally, you are advised to prepare meaningful size pictures of physiographic diagram and hachure from local materials.
- Different contour maps from reference materials such as a concise map reading courses for Ethiopian high school and from geography EGSEC exam papers of different years.

4.2 Suggested teaching Methods

Some of the methods to be implemented in this lesson are brainstorming, independent task, group discussions and demonstrations.

4.3 Pre Lesson Preparation

Read critically about the traditional and modern methods of representing relief on maps from available reference books and other possible sources. Select suitable teaching aids, decide the size of group members and allocate enough time for group discussions.

4.4 Presentation of the Lesson

a) Introduction to the lesson

At this stage, students may have very limited knowledge about the different methods of showing relief on maps. Therefore, it should be advisable to start the lesson by asking the following questions:

- What does relief mean?
- What kind of landforms or relief features are found in your locality?
- How do you show such reliefs on a map?

The above questions need to be treated very well inorder to acquaint students with background knowledge and widen their imagination.

As a discussion goes on let students try to represent the different types of relief of their localities using their own methods. And, after a while, give a chance to classify what they are used in to traditional and modern methods.

b) Body of the lesson

i. Traditional Methods:

To explain this, draw or put some sample map that shows traditional methods on the blackboard, and ask the students the following questions:

- Do you know the methods indicated on the blackboard?
- What kind of similarities and differences do you observe from the pictures?
- Which method appears to be the simplest one? Why?

From such discussions, you can draw the attention of students to the following traditional methods of showing relief on maps:

Physiographic Diagram

In dealing with the physiographic diagram, it is appropriate to ask the class questions like:

- What does physiographic diagram mean?
- Why does such method lack accuracy in representing relief on maps?

These and other questions can be raised in the discussion by considering the following points:

* Physiographic diagrams were old attempts of map making with three dimension.
* It is simple and easy to understand but it has a number of limitations such as:
  - Some geographic details of an area would be hidden from view behind the "backs'' of the pictures of hill or mountain.
  - It lacks accuracy because it is drawn without scale, heights and identified slopes. (See figure 1.17).

Hachures

Let the students study closely figure 1.18 in small groups for a while. And guide the discussions using the following questions:

- What are hachures?
- How do you identify steep and gentle slopes from the figure?
- What are the main differences between figure 1.17 and 1.18.
- What are the weak sides of hachures?

Encourage students to read and interpret figure 1.19 and, later on, conclude the discussions based on the following points:

* Hachures are short and disconnected lines which represent slopes.
* They are drawn in the direction in which water flows.
* Closely and widely spaced hachures are shown steep and gentle slopes respectively.
* Some of the limitations of hachures are as follows:
  - flat areas are unshaded and therefore, plateaus and plains are confused.
  - they do not indicate the heights and exact gradients of the relief.
  - it is difficult to read and interpret.
* Currently, hachures are not commonly used. But, in some cases, they are used in combination with contourlines to identify escarpment, crater and depression.

Hill shading (Oblique Illumination)

Remind the students what they have learnt before by asking relevant questions.

Give the students the chance to observe figure 1.19 and let them discuss the following questions in pairs:

* How can the types of slope identified using the source of light?
* What improvements have you observed in the figure?
* What are the main problems of hill shading?

You have to facilitate the discussion using the following important points:

* slopes can be identified using shading system based on the source of light.
* hillshading has the following limitations:
  - it doesn't give absolute heights above mean sea level.
  - it fails to indicate whether the ground is sloping upward or downward.
  - detailed information is obscured by shading.
* to improve the above weak points, hillshading is used in combination with spot heights and contours. Such combinations offer a clear impression of land forms.

Layer Coloring (Layer tinting)

Using wall map of the world, let students identify the different elevation zones shown by layer colouring. After a while, ask them what the main shortcomings of layer tinting are.

During the discussion, the main points you need to stress are:

* Layer colouring is a method of showing different elevation zones of a relief using various colours.
* Its main purpose is to make the highland immediately distinguishable from the lowland.
* It also has the following limitations:
  - it doesn't show the gradual changes of slopes
  - some clours may create a wrong impression in the map reader's mind. For example, green colour may suggest vegetation or fertile area (See figure 1.20).

Formlines

Before dealing with formline, ask students to describe the kinds of improvements they have noticed from those methods discussed so far. And then let them discuss form line in small groups using the following questions:

* What are formlines?
* Why are formlines better than the previous methods of showing relief on maps?
* What are the main problems of formlines?

You have to use formlines map and try to sum up the discussions using the following points:

* formlines are imaginary lines joining points with the same altitude on maps.
* usually they are drawn on topographic maps using picked or broken lines with approximate heights.
* they are unumbered and mostly drawn without a fixed interval.

Generally, formlines represent the shape of a relief with little or no references to sea level.

ii. Modern method

Contour lines (Isohypses):

Meaning and properties

Let the students see figure 1.21 independently and then try to answer the following questions:

* What did you observe from the figure?

* How is it different from the previous methods?
* How do you describe contour lines?
* What is the vertical interval of the map?
* What are the heights of the points represented by four letters on the contour map?

Based on the responses of the students, you have to describe in detail the concept and main properties of contour lines using the different figures shown in the text book. Here, the main points you need to focus are:

* Contour line is an imaginary line connecting points that have the same elevation above mean sea level.
* Contour lines:
  - can't merge or cross one another except at vertical cliffs, waterfalls or over hanging cliffs.
  - never branch
  - are always numbered in the direction towards where altitude increases
  - spacing indicates the nature of slopes, both steep and gentle slopes.
  - can be printed with a difference in thickness to simplify contour readings.
  - can show the various types of land forms.

Different methods of showing altitudes on Maps

Give students the chance to remind the class about the major properties of contour lines. And then proceed with the group discussion by asking the following questions using figures 1.29 and 1.30.

* What specific heights are shown on the map of figure 1.30?
* What are the methods applied on the map to show such specific heights?
* What are the main differences observed among the methods used on the map?

The students may give many different answers to the above questions. However, the idea is to make them conscious of the need to have additional means of indicating altitudes on contour maps. In other word, explain to the class that contour lines do not show specific heights such as mountains peaks, hill tops, valley floors, towers, towns, roads or railways, etc. Such specific heights are shown on maps by the following methods:

* spot heights

* trigonometrical points (stations)
* bench marks
* printing the heights of lake levels
* printing the altitude of run ways, towns, etc.
* calculating altitude

After discussing the above points with appropriate maps, it is important to let students do activity 1.12.

Slope and Gradient

Slopes on Contour map

Students have now a good experience about contour lines. Using this as a background knowledge, let them discuss in pairs using figures 1.31 up to 1.35 based on the following questions:

* What is slope?
* How can you identify the types of slope from contour map along a certain altitude?
* Why are spacings between contour lines mostly not the same throughout a map?

After the above brain-storming activity, the discussion should consider the following points.

* slope is the steepness or degree of inclination of the land surface of an area.
* steepness of a slope depends on:
  - distance between contourlines
  - vertical interval
  - the scale of a map

Using the aforementioned criteria, you have to describe the types of slope by using different figures shown in the text book. More specifically you have to show the students in group:

* how to read the slopes based on the space between contour lines.
* how to draw the cross section along a given two points.
* how to identify types of slopes from a contour map.

After a while, let them discuss and practice in group using different activities from the text book in order to demonstrate and share their skills among themselves.

Gradient on Contour maps

Remind the class what they have discussed previously about slope and let them do the following questions independently:

* What does it mean by gradient?
* How do you calculate gradient from contour map?

Using the responses of students as an input, try to consider the following points:

* Gradient (GR) is the degree of a slope between two points along a given distance on a hill slope, along a river, road or railway.
* It can be stated in three ways:
  - $\text{GR in ratio} = \dfrac{\text{Altitude difference between two points}}{\text{Map distance between the same points}}$
  - $\text{GR in percent} = \dfrac{AD}{MD} \times 100$
  - $\text{GR in degree} = \dfrac{AD}{MD} \times 60^{o}$

By referring figure 1.36, you have to elaborate the procedures used to calculate gradient in ratio, in percent and in degrees and also give the student an independent task accordingly.

Field Distance

Ask the students about the types and methods of calculating distance on a map. This may help to remind them of what they have learnt in the previous grade, especially about straight and bending line distances.

Using the prior knowledge of the students, you have to led them to the third type of distance by asking the following questions:

* What is field distance?
* How can you find it from a contour map?

During the discussion, you should elaborate the concept of field distance, which is the actual distance that takes into account the ups and downs of the relief of a certain area. And use figure 1.38 in order to show them how to find the field distance using the following formula:

$$(FD)^2 = (MD)^2 + (AD)^2 \Rightarrow FD = \sqrt{(MD)^2 + (AD)^2}$$

Based on the discussion you made, let students do activity 1.15 and give them a chance for reflection among themselves.

c) Stabilization

Review the main ideas and concepts of the lesson.

- In the past different attempts are made to represent relief on maps using old methods (physiographic diagram, hachures, hillshading, layer coloring and formlines), which were in accurate and couldn't provide the right information to the users.
- Currently both hachures and formlines are still used in some special cases. The former is used in combinations with contour lines to identify escarpment, crater and depressions, whereas, the later also served to show incomplete survey work and sea depths.
- Contour lines (Isophypses) are the modern and most accurate way of showing relief on maps with some unique properties.
- Contour lines don't show specific heights of features (like mountain peaks, hilltops, valley floors, towns, roads, etc.) such heights can be shown on maps using spot heights, trigonometric points, benchmarks, etc.
- Depends on the nature of spacing of contour lines between two points, it is possible to identify different types of slopes such as even, concave, convex and terraced slopes.
- Gradient is the degree or rate of change of slope between two points. It can be expressed in ratio, in percent and in degree.
- Field distance is the distance that accounts the ups and downs of the land surface. In other words, it is the actual distance measured on the ground.

4.5 Evaluation and Follow up

a) Evaluation

Let students do the following tasks:

* prepare relief models, diagrams, cross-sections or sketch maps of any known or hypothetical landscape.
* make a field visit to the school or home area of the students and then draw a sketch map showing the relief of that locality.
* identify contour lines and other lines commonly used on contour maps.

b) Follow up

Facilitate group discussions and encourage students accomplish properly the practical exercises and activities included in the topics and also grade them accordingly.

c) Additional Activities

1. How do identify rivers and roads from contour maps?
2. Let Abebe and Gemechu stand at different altitudes somewhere on the middle of a mountain with concave slope between them. If Abebe stood at higher altitude, do contour lines wide a apart or close to each other? Why?
3. If town "A" and town "B" have an altitude of 500 m and 2500 m respectively. If the maximum gradient is 25%, what is the shortest possible road distance between the two towns?

4.6 Answer key for Activities

Activity 1.8

a. south east b. north west

Activity 1.9

Hachures are to some extent better than physiographic diagram, because they try to show how to identify gentle and steep slopes by widening and closing the hachures respectively.

Activity 1.10

Great attempt is made in figure 1.17 in order to show various land forms in the areas of Lake Tana and Abay river using three dimensions.

Activity 1.11

For instance the following towns have different altitudes so that they are identified on the Ethiopian Atlas using different colors (you are required to provide move example).

Town	Altitude (meters)	Colors used
Kebre Dahar	550	Green
Dire Dawa	1160	Yellow
Goba	2743	Brown

Activity 1.12

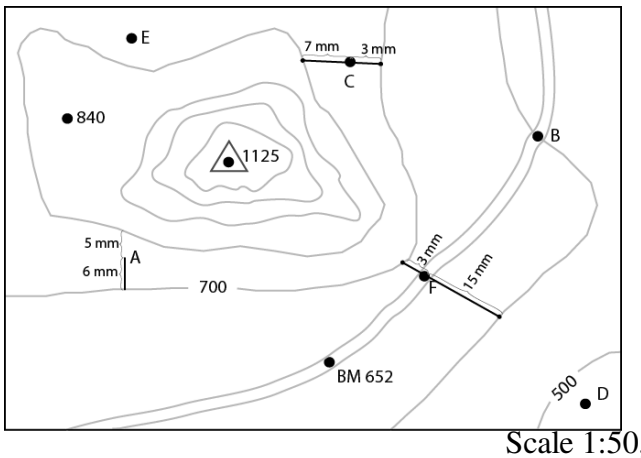
1. Traditional methods of showing relief on maps don't have scales and as a result, they are not accurate.
2. Example; hachures are used in combination with contour lines to represent some land forms such as escarpment, crater and depression.

Activity 1.13

1. Summit – the highest point or top of a mountain.
   Col – a deep and wide v-shaped cut in the summit-line of a mountain chain, like a pass.
   Gap – a narrow valley or gorge cut by a stream across a ridge. If the river still occupies a gap, it is a water-gap. If the river abandons it, the gap becomes a wind-gap.
   Bay – a broad curving inlet of sea or an ocean or lake.
   Spur – a prominent, average wide projection on a mountain side. It can also be found b/n two rivers at a confluence.
   Meander – a winding course of a river (snake-like bends) following a weak and leveled land.
   Plain – a large area of flat land, generally lower than the land around it.
   Plateau – upland areas with surface of some degree of altitudinal uniformity and delimited usually by steeper slope, sometimes known as tableland.
   Ridge – long mountain range.
   Convex slope – a slope with a steep gradient near the base and a gentle gradient near the top.
   Concave slope – a slope with a gentle gradient at the foot and a steep gradient near the top.
2. The answers for (a – f) are left to the teacher. Because this teacher guide printed in black and white, it is impossible to show different colors on the given figure. However, the teacher has to give more attention to differentiate contour lines, rivers, roads and different altitudinal ranges using the required colors accordingly.
   g. 600 m h. i. 2900 m ii. 1834 m

Activity 1.14

1. Spot heights, Trigonometrical points and Benchmarks (BM).
2. Altitude of point F



Scale 1:50,000

$$\text{Altitude (F)} = \text{LC} + \left(\frac{d_1 \times \text{VI}}{D}\right)$$

$$= 600\text{ m} + \left(\frac{15 \times 100}{18}\right) = 683.33\text{ meters}$$

Altitude of B is equal to the altitude of the contour line, i.e. 600 m

$$\text{Altitude (c)} = \text{LC} + \left(\frac{d_1 \times \text{VI}}{D}\right)$$

$$= 700\text{ m} + \left(\frac{3 \times 100}{10}\right) = 730\text{ meter}$$

3. Highest altitude = 1125 m

   Lowest altitude = somewhere between 400 m – 500 m.

4. The road distance between village F and village B can be obtained in the following ways:

   - Scale 1: 50,000 (1 cm to 0.5 km)

   - Measure the distance on the map between F and B using thread (since it is a bending line)

   MD = 2.5 cm convert the MD into GD using the scale.

   GD = 2.5 × 0.5 km = 1.25 km (the road distance between the two villages).

5. Ground area of the map.

   Area of the map = length × width

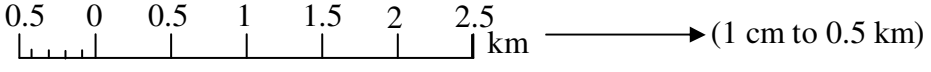
   Length = 9.2 cm = 4.6 km

   Width = 6.2 cm ⇒ 3.1 km

   Scale = 1: 50,000 (1 cm to 0.5 km)

   Ground area of the map = 4.6 km × 3.1 km = 14.26 km^2

6. The graphic scale of the map is



Activity 1.15

2. The types of slope between:

   a. D and E is terraced

   b. A and G is convex

   c. D and F is terraced

Activity 1.16

1. **Given**:

   MD = 10 cm, AD = 2400 m – 1700 m = 700 m

   Scale = 1: 1,000,000 (1 cm to 10 km)

   Use the scale to convert MD into kilometer

   MD = 10 cm = 1 cm × 10 km = 100 km

   Convert AD in to kilometer (here no need of using the scale, because the AD is actually on the ground).

   AD = 700 m

$$= \frac{1\text{km} \times 700\text{m}}{1000\text{m}} = 0.7\text{km}$$

Now you can calculate the gradient between Addis Abeba and Adama:

i. In ratio

$$\text{GR} = \frac{\text{AD}}{\text{MD}} = \frac{0.7\text{ km}}{100\text{ km}} = \frac{7}{1000} = 1:143$$

ii. In percent

$$\text{GR} = \frac{1}{143} \times 100 = 0.7\%$$

iii. In degree

$$\text{GR} = \frac{1}{143} \times 60^{o} = 0.4^{o}$$

Activity 1.17

1. Gradient between A and D

   In order to get the MD between A and B connect the two points with straight line and measure the distance using ruler.

   MD = 7 cm (obtained through measurement)

Scale = 1: 50,000 (1 cm to 0.5 km)

MD = 7 × 0.5 km = 3.5 km

AD = 1300 m – 1050 m = 250 m = 0.25 km

In ratio

$$\text{GR} = \frac{0.25 \text{ km}}{3.5 \text{ km}} = \frac{25}{350} = 1:14$$

In percent

$$\text{GR} = \frac{1}{14} \times 100 = 7.1\%$$

In degree

$$GR = \frac{1}{4} \times 60^{\circ} = 15^{\circ}$$

2. i. In percent $\frac{1}{100} \times 100 = 1\%$, In degree $\frac{1}{100} \times 60^{\circ} = 6^{\circ}$

ii. $\frac{1}{25} \times 100 = 4\%, \frac{1}{25} \times 60^{\circ} = 2.4^{\circ}$

iii. $\frac{1}{50} \times 100 = 2\%, \frac{1}{50} \times 60^{\circ} = 1.2^{\circ}$

3. i. In ratio $\frac{35}{100} = 1:2.9 \approx 1:3$, in degree $= \frac{1}{3} \times 60^{\circ} = 20^{\circ}$

ii. $\frac{75}{100} = 1:1.3, \frac{1}{1.3} \times 60^{\circ} = 46.2^{\circ} \approx 46^{\circ}$

iii. $\frac{12}{100} = 1:8.3, \frac{1}{8.3} \times 60^{\circ} = 7.2^{\circ} \approx 7^{\circ}$

Activity 1.18

1. Field distance between C and D

Distance on the map = 4.3 cm (obtained through measurement from the map)

Scale = 1: 25,000 (1 cm to 0.25 km)

MD = 4.3 × 0.25 km = 1.075 ≈ 1.1 km

AD = 400 m – 50 m = 350 m = 0.35 km

$$\text{FD} = \sqrt{(\text{MD})^2 + (\text{AD})^2}$$

$$= \sqrt{(1.1 \text{ km})^2 + (0.35 \text{ km})^2} = \sqrt{1.21 \text{ km}^2 + 0.12 \text{ km}^2} = \sqrt{1.33 \text{ km}^2} = 1.15 \text{ km}$$

2.

1. AD = 6000 m = 6 km $FD = \sqrt{(30\ km)^2 + (6\ km)^2} = \sqrt{900\ km^2 + 36\ km^2}$

MD = 20 cm = 30 km $= \sqrt{936\ km^2} = 30.6\ km$

3. AD = 1500 m = 1.5 km $FD = \sqrt{(2.5\ km)^2 + (1.5\ km)^2} = \sqrt{6.25\ km^2 + 2.25\ km^2}$

$= \sqrt{8.50\ km^2} = 2.9\ km$

Answer key for Additional Activities

1. River and roads can be identified from contour maps:
   - by their printed colours
   - rivers frequently have branch lines that show their tributaries at the higher altitudes and gradually form a single line towards the lower altitude.
   - roads are usually printed with single or double bold lines crosses contour lines.
   - the symbols of road and river are also shown on the key of the map.
2. The contour lines are closer to each other. Because the slope between Abebe and Gemechu is concave, then such slope is at the top and gentle at the bottom of a map.
3. AD = 2500 m – 500 m = 2000 m = 2 km

   Using the formula for calculating gradients, you can get:

$$25 = \frac{2\ km \times 100}{X} \text{ or } X = \frac{200\ km}{25} = 8\ km$$

   X = 8 km (the length of the road between town A and town B).

Answer Key for Unit One Review Questions

Part I True or False

1. True 2. False 3. False 4. False 2 True

Part II Matching

6. C 7. D 8. A 9. B 10. F

Part III Choice

11. A 12. D 13. B 14. B 15. B

Part V Fill in the Blank

16. Compass points or angular bearings
17. Scarp slope
18. Pantograph
19. Escarpment

Part IV Short Answer

20. The main difference between contour lines and form lines can be described in the following way:

Form lines:	**Contour lines:**
* usually drawn with broken lines	* use continuous line
* not drawn at a fixed interval	* have fixed interval or vertical interval
* often they are unnumbered	* numbered towards the increasing direction of the altitude
* represent with the shape of an area with little or no reference to sea level	* show accurate altitude measured from sea level.

21. Some of the shortcomings of hachures are:
    * Flat areas are unshaded. As a result, plateau and plains are confused
    * They do not indicate the height above sea level
    * They are laborious to draw and become difficult to read and interpret.
    * The summits of hills and the floors of valleys have no hachures. Thus, ridges and valleys are sometimes confused.
22. Cliff is a vertical mountain wall.
23. Spot heights are shown only on the map but the trigonometrical points can be indicated both on the map and in the field.

Part VI Things to Do

24. In order to get the scale of the map, you have to use given latitudes
    $12^o\ 45' - 12^o\ 30' = 15'$

Distance from 12^o 45′ to 12^o 30′N on the ground is ≈ 28km because, at the equator 1^o = 110.5 km ≈ 111km = 60'

60' = 111km

15' =? $= '\frac{15' \times 111km}{60'} \approx 28$ km

Distance on the map between 12^o 45′ and 12^o 30′N is 7cm. Then,

7cm = 15' = 28 km

Therefore, the scale of the map is 7cm to 28km (1cm to 4km) or the approximate RF of the map is 1:400,000.

25. i. 45^o ii. 67.5^o iii. 337.5^o

26. Hint: AD between C and E is:

2600m – 1100m = 500m = 1km

Distance on the map between C and E is:

4cm = 1.6km (because the scale is 1:41, 176 or 1cm to 0.4km)

27. Area of a cliff can be identified where two contour lines are over lapping. Please show the rest of the answers by drawing cross sections.

Check List

Check the student's performance according to the given competencies referring the questions under the check list for every unit. Put a tick (✓) mark against each task weather they are able to perform in the competencies of each unit. The students are expected to respond saying Yes or No. then, you can make your own evaluation whether the competencies are met or not.

Can you:

	Yes	No
1. Acquire the skill of finding direction on a map?----------		
2. Show direction of a given place on a map by means of compass direction and bearings? ----------		
3. Explain the use of magnetic compass? ----------		
4. Practice how to find direction and bearings of points on maps? ----------		
5. Define what geographical grid system mean? ----------		
6. Define what geographical grid system mean? ----------		
7. Demonstrate the position of a given place by means of geographic grid system?----------		
8. Define what national grid system mean? ----------		
9. Define what national grid system mean? ----------		
10. Show the position of places on maps using national grid references (four and six digits grid)? ----------		
11. Demonstrate the national grid origin of Ethiopia? ----------		
12. Enlarge and reduce maps using a pantograph or square methods? -------		
13. Compute the scale of enlarged or reduced map? ----------		
14. Describe methods of showing relief on maps? ----------		
15. Define the term contour lines? ----------		
16. Discuss the properties of contour lines? ----------		
17. Distinguish contour lines and isolines? ----------		
18. Identify the different ways of showing specific height on contour map? ----------		
19. Compute the altitude of points between contour lines? ----------		
20. Explain the term slope? ----------		
21. Demonstrate types of slope? ----------		
22. Describe the term gradient of slope? ----------		
23. Compute gradient of slope? ----------		
24. Express gradient in different ways? ----------		
25. Calculate field distance? ----------		

Unit Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly. Thus

A student at a minimum requirement level will be able to explain the use of magnetic compass, define geographical grid and national grid systems; and demonstrate the position of a given place using geographical grid system and national grid references (of four and six digits grid references); demonstrate the national grid origin of Ethiopia and practice how to find direction and bearings of points on maps. Enlarge and reduce maps using a pantograph or square methods, compute the scale of enlarged or reduced map, describe methods of showing relief on maps, define the term contour lines and discuss their properties. Identify in different ways of showing specific heights on contour map and compute the altitude of points between contour lines. Explain the term slope and types of slopes, compute gradient of slope and express it in different ways and calculate field distance.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to measure direction on maps using protractor, calculate magnetic declination of varied maps and find deviation from the true North. Compute scale of map using national grid references, construct a relief map using physiographic diagrams, and distinguish types of slopes from contour map of a given area.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue and achieve more.

Exemplary Lesson Plan

In the introduction part of this guide it was cited that a breakdown of the lesson topics into instructional units and preparation of lesson plans is necessary for effective teaching. An example is given below to show how to prepare a plan. You can use this sample lesson plan for all of the topics in the textbook.

Lesson -------- Time: 40 minutes

1. Topic: "Direction on Maps"
2. Objectives: Upon the completion of the lesson the students will be able to:
   - describe the concept of direction

- identify the direction of a given place, using compass points
- acquire skills of measuring direction and bearing

3. Suggested Teaching Aids
   - 3.1 Illustration – Refer to Figure 1.1, 1.2 and 1.3 in the student's textbook.
   - 3.2 A chart that shows compass points
   - 3.3 And an ordinary compass in possible
4. Instructional strategy
   - 4.1 Question and answer
   - 4.2 Demonstration and Explanation
5. Introducing the topic (5 minutes)

   Inorder to start the lesson from what students know, ask:

   a. What do you see on a compass
   b. What are cardinal points
   c. How do we measure direction from one point to another? Before you begin explaining about the new concept you have to answer the above questions you have asked the class in brief.

6. Core-Development (25 minutes)

   Based on the above discussion proceed to the introduction of the science of direction.

   The science of direction goes back to man's earliest observations of nature, especially the stars and winds. People got into the habit of thinking of **directions** in terms of wind-source. We still speak of the direction as "the four winds" and ask from what "quarter" a wind or a rumour comes.

   After so many trial and error the direction finder which finally freed man from getting out of right of land the magnetic compass was invented.

   Nobody knows who invented it or just when. The ehinese the Arabs, the Greeks, the Italians and the Finns all claim to be the original inventor.

   - Mostly the four cardinal points of the compass North, East, South and West are familiar.
   - There are thirty-two points, but only sixteen are functional to describe direction.
   - The points midway between the cardinal points are North-East (NE), South-East (SE) etc --- The others are North-North-East (NNE), East-North-East (ENE) describing further sub-divisions.

In dealing with these concepts use varied techniques during the lesson presentation. For example some of the practical activities you can engaged with the lesson could be:

a. Demonstration

- the concept of direction can be thought by use of objects in class or students them relves can ask practice which students stands east, west etc. from a reference point of view.

b. Use illustrations

- Make use of diagrams given in the textbook to show the compass and its points.

N.B. In this lesson there are two basic methods of learning that the teacher needs to be aware of: These are:

i. Observation – students have experience by comparing and looking objects around the, how they got in place from direction perspective.

ii. abstraction – imagination of what is not seen.

7. Conclusion

7.1 summary

i. Compass are marked with digress as well as direction points.

ii. Wind direction is named after the direction from which the wind blows.

7.2 Evaluation

i. Ask students from where we start measuring direction

ii. Let the students define bearing.

Unit 2 THE PHYSICAL ENVIRONMENT OF THE WORLD AND ETHIOPIA

Total Periods Allotted: 26

1. Unit Introduction

By now, there is no doubt that students can describe the direction and position of a given place (country) on a map. It is believed that they have also developed a skill to enlarge and reduce a map and identify the different relief types on the earth's surface. With this background knowledge, they might be motivated enough to question the origin and the materials that form the earth's crust and its atmosphere.

In this unit, you are expected to guide your pupils to understand that the origin of the universe is an open-ended question and that the search for it is a live and ongoing process. As young scientists and part of the earth's community, they have enough room to contribute.

Further in the unit they are supposed to learn about the orderly nature of our solar system and about the inference which established that the earth and other planets including the sun were formed from the same material in the universe.

In the process, the unit deals with how the earth's different physical elements are systematically arranged and how they interact with each other, beginning with the structure of the earth, geological events, components of the earth's physical environment, earth's climate and ecosystem. It was decided to start the lesson with the concept of the earth in the universe.

2. Unit Outcomes

After completing this unit, students will be able to:

- *understand the origin of the earth and its tectonic movements.*
- *describe the movement, composition of the earth and components of its physical environment.*
- *discuss climate classification, change and climate of Ethiopia.*
- *Explain factors that affect the diversity of Fauna and Flora and soil in the* ecosystem.

3. Main Contents

2.1 THE EARTH IN THE UNIVERSE

2.2 CLIMATE

2.3 CLIMATE OF ETHIOPIA

2.4 ECOSYSTEM

2.1 THE EARTH IN THE UNIVERSE

Periods Allotted: 10

1. Competencies

Upon completion of this subunit, students will be able to:

- *discuss the concept of universe*
- *identify the position of the earth in the solar system*
- *identify the position of the earth in the solar system.*
- *explain the origin of the earth*
- *demonstrate the structure of the earth*
- *describe the geological time scale and major events*
- *realize the major geological events of Ethiopia*
- *describe the concept of continental drift theory.*
- *describe the characteristics of each type of rocks.*
- *demonstrate major rock distribution in Ethiopia*
- *state causes and impacts of soil degradation in Ethiopia.*

2. Contents

2.1.1 Origin and structure of the earth.
2.1.2 Geological time scale and major events
2.1.3 Geological events in Ethiopia
2.1.4 Movements of continents
2.1.5 Components of the Earth's physical environment
- **Rocks**
- **Soil**

3. Overview

Origin of the Universe

Matter, energy and space came to existence with a single event called the *big bang*. Astronomers calculate the timing of the big bang by measuring speeds of galaxies and the distances among them. Estimates of the age of the universe, starting at the big bang, vary from about 10 billion to 15 billion years.

The birth of our solar system began as dust and gases (nebula). The nebula contracted into a rotating disc and cooling made the nebula to condense into tiny solid particles. Repeated collision caused the dust-size particles to change into asteroid size bodies. Within a few million years, these bodies changed into the planets.

The Structure of the Earth

The crust mantle and core. Each of these layers is further subdivided. The crust consists of continental and oceanic crust. The uppermost mantle is solid. Solid rock like the curst (lithosphere), while the rest of the mantle is not weak, and plastic (as thenosphere).

The core consists of an outer liquid region surrounding a solid centre. The temperature at the earth's centre is about 6000^{o}c, similar to that of the sun's surface.

If erosion were the only force shaping the earth's surface, the world around us would have been worn smooth long ago. But as erosion wears down the land, forces inside the earth continue to push up the surface and break it apart.

Scientists have found that our planet is composed of four distinct layers. In the center is the solid inner core, and the next layer is the liquid outer core. The minerals of the core area are rich in iron. Surrounding the two cores is the mantle, a mostly solid layer. A thin rigid curst covers the mantle. If the earth were an apple, the crust would be as thin as the apple's skin. The world of people and all other living things is located in a narrow zone at the top of the crust and the bottom of the atmosphere.

Geological Time Scale and Major Events

Geologists estimate that the earth formed 4.6 billion years ago. No one knows exactly when the first living organisms evolved, but we know that life existed at least as early as 3.8 billion years ago, 800 million years after the planet formed.

For the following 3.3 billion years, life evolved slowly, and most of the biosphere consisted of single-celled organisms. Then organisms rapidly became more complex, abundant, and varied, about 543 million years ago.

The dinosaurs flourished between 225 million and 65 million years ago.

Homosapiens and our direct ancestors have been on this planet for only about 0.1 percent of its history.

Geological Events in Ethiopia

During the Precambrian era, Ethiopia was made up of huge mountains which were folded and faulted. During the Paleozoic era, the land was greatly affected by erosion. At the beginning of Mesozoic era, the land surface sank slowly. As a result, the sea invaded the land. In the process, the layers of sandstone and limestone were deposited one over the other.

During the Cenozoic era, Ethiopia experienced two major geological events

1. the uplift of the Ethiopian landmass followed by crustal deformation and lava flow.
2. during the middle Tertiary, the land was subjected to major vertical displacements which produced the formation of the Ethiopian Rift Valley.

It was reported that the formation of the Red sea and Gulf of Aden, and separation of the Arabian Peninsula from Africa, were the result of formation of the Great East African Rift valley.

The Movements of Contents

The 100 kilometers-thick portions of the cells that glide over the earth's surface, carrying continents and ocean basins as their uppermost-layers, are called tectonic plates, after the Greek term tektoniks, meaning "construction". The movements of these plates construct continents, mountain ranges, and ocean basins; tectonic movements also cause earthquakes and volcanic eruptions.

The entire mantle surface layer system circulates in great cells extending from the core-mantle boundary to the earth's surface. The term *convection* refers to the upward and downward flow of material in response to heating. A single convection cell may cover thousands of kilometres. The cells transport both rock and heat from the deep mantle to the earth's surface.

Today, continents are moving across the earth's surface at rates from less than 1 to 16 centimetres per year.

The theory of plate tectonics helps explain how the world's large landforms were formed. This theory views the earth's crust as divided into more than a dozen rigid, slow-moving plates. Scientists have determined that the processes of plate tectonics usually take millions of years to cause major changes. The plates move like a giant ship cruising slowly over the upper mantle. Some plates are huge and otherplates are much smaller. They can be more than 97km thick under the mountains of continents. But they are about 10km thick at sites below the oceans where the plates are moving apart.

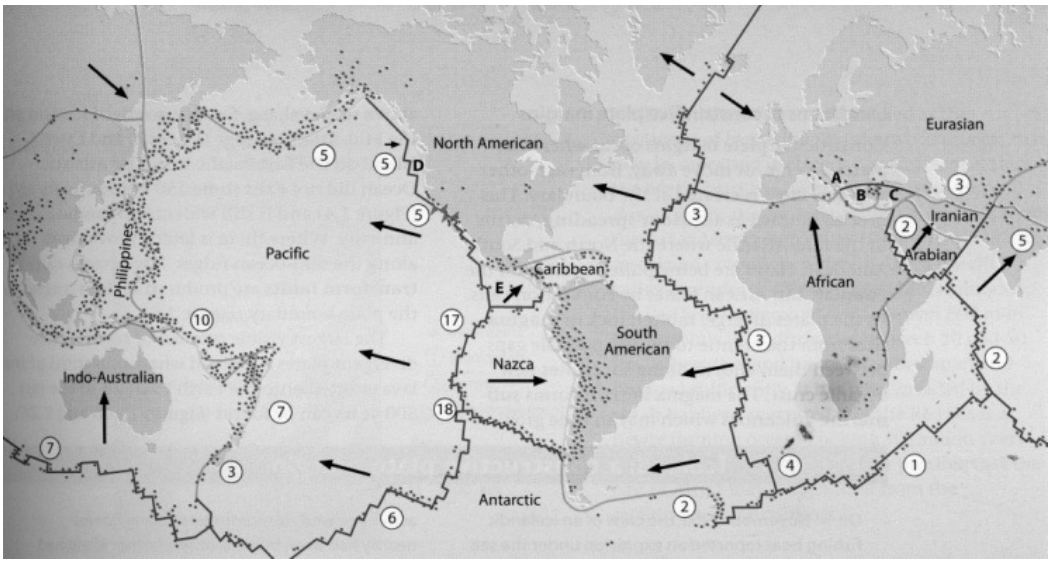


Figure 2.1 Plate boundaries and active zones of the Earth's crust

Scientists believe that the earth's crust is divided into more than a dozen rigid, slowing moving plates. This map shows the location of the plates. The arrows indicate the direction in which they are drifting.

Components of the Earth's Physical Environment

The earth's four realms include the lithosphere, hydrosphere, biosphere and atmosphere. The lithosphere covers the upper solid crust, which is further dived as continental and oceanic crust. The oceans make up the hydrosphere. The atmosphere lies within 30 kilometers of the surface, and the biosphere is a thing shell about 15 kilometers thick.

- What are the four parts of the earth system?
- Why is Earth the only planet in our solar system to support life?

Earth is a complex planet. Of all of our solar system's planets, Earth is unique in that it is the only planet that supports life as we know it. Geographers call the interactions of elements on and around the earth the earth system. The earth system can be divided into four physical systems that work together to create our physical environment: the atmosphere, the lithosphere, the hydrosphere, and the biosphere.

The **atmosphere** is the layer of gases that surrounds the earth. This mixture of moving gases provides the air you breathe and protects the earth from the sun's intense harmful radiation. The **lithosphere** is the surface of the planet that forms the continents and the oceans, or the land, and in the atmosphere – form the **hydrosphere** (The prefix hydro-

means “water”). The part of the earth in which all the planet’s plant and animal life exists is called the **biosphere**.

These systems are interrelated. So, we cannot draw strict dividing lines between them. The hydrosphere supplies humans with water and also serves as a home to animal and plant life. The hydrosphere affects the lithosphere when, for example, a stream flows over rock, causing the rock to worn down. Soil can be examined as part of the lithosphere, biosphere, or hydrosphere.

As far as scientists explanation goes, no other planet in the solar system has four physical systems. Earth’s nearest neighbours, Venus and Mars, each have an atmosphere and a lithosphere. But because of extreme heat or cold, these planets lack supplies of water. Without water, there is no life or biosphere. In our solar system, only Earth has the necessary four physical systems that work together to support life.

Rocks

Geologists group rocks into three categories on the basis of how they form: igneous rocks, sedimentary rocks and metamorphic rocks.

Rocks of all kinds decompose, or wither away, at the earth’s surface, mostly as a result of interactions between water, atmospheric gases, and the rocks.

No rock is permanent over geological time; instead all rocks change slowly from one of the three rock types to another. This continuous process is called the *rock cycle.*

Igneous rock: is formed when the molten material called magma from a volcano or from deep inside Earth cools. Most magmas come from regions deep below Earth’s surface. They exist at depths ranging from near Earth’s surface to about 150km below the surface. Temperatures of magmas range from about 650^{o}c to 1200^{o}c depending on the chemical composition and pressure of the magma.

Intrusive igneous rocks: Rocks that form below Earth’s surfaces are **intrusive** igneous rocks. Generally they have large mineral grains.

Extrusive igneous rocks: are formed as lava cools on or near Earth’s surface. When lava flows on Earth’s surface, it is exposed to air and moisture. Lava cools quickly under these conditions. The quick cooling rate keeps large minerals grains from growing. Extrusive igneous rocks have a fined grained texture.

Sedimentary rocks form: when sediments become pressed or cemented together, or when minerals come out of mineral rich solutions, or are left behind by evaporation.

Biochemical Sedimentary Rocks: When rocks form from the remains of once-living things. One of the most common biochemical sedimentary rocks is fossil-rich limestone.

Metamorphic Rocks: are rocks that have changed because of changes in temperature and pressure or the presence of hot, watery fluids. Sometimes, the composition of a new metamorphic rock is different from pre-existing rock.

Soil

The necessary foundation for sustaining life on the earth's surface is soil. We are already familiar with the outer layer of the earth which is called the crust. Most of this layer, up to forty kilometres thick, is solid rock. In most areas, however, soil covers the surface of the crust. Although we often call soil "dirt" or "earth", the word *soil* specifically denotes this material with the ability to support life.

Parent materials are the major materials from which the particles in the soil are formed. The rock particles of the soil must be the size of sand or even smaller in order to be considered soil.

Soil differs from place to place, and there are hundreds of soil types. Climate is the major factor that determines the type of soil a location will have. A region's climate type controls the amount of sunlight, moisture, and natural vegetation that influence the soil's formation.

The second major control is the rock type that provides minerals for the soil. One region may have dark, thick soil with much humus, while another has only a thin layer of sandy soil. Other factors such as the slope of the land, human activities, and time for soil development, are also important.

4. Teaching-learning Process

This part of the teacher guide in the sub-unit plan is where the active lesson learning discussed. Suggested teaching aids are allocated according to the nature and requirement of the lesson topic. Teaching methods and their presentation in line with the text book and the nature of the subject are and facilitate the teacher as initial resource.

4.1 Suggested Teaching Aids and Reference

- Globe
- Physical map of the world
- World atlas
- Map of Ethiopia
- Samples of rocks and soil types that are preserved at the school library or educational centers
- Manually drawn figures on charts (eg. rock cycle, percentage components of soil, the layers of the crust, etc.)
- Video – that show plate boundaries, soil erosion, different types of rocks, methods of protecting soil erosion, etc.

4.2 Suggested Teaching Methods

Brainstorming – let the students guess and forward their ideas and facts and share experiences in class. List what they guess on the black board and add your own points while clarifying concepts. For Example, this is important, when you are teaching topics like the origin of universe, geological time scale, etc.

Demonstration – Use figures on charts or sketches on the black board to explain topics in this sub-unit. For Example, while explaining plate tectonic it is appropriate to show the figures of different plate boundaries to touch the perception of students. Soil erosion and its regulator method can be best present using Video and other visual methods.

Question and answer method – you are supposedto ask questions that are of low order type and gradually shift to the higher order type of questions in each specific lesson (see general information).

Field trips: arrange a field trip near your school compound to make direct observation on students side on lessons like erosional activity, soil degradation, deforestation etc. For example, Gully erosion is available everywhere near a short distance from your school.

Resource visitors: In this sub-unit, inviting resource persons may become important/advantageous in dealing with topics like plate tectonic, rocks, soil etc, from geology department, and mining sectors.

4.3 Pre-lesson Preparation

4.4 Presentation of the Lesson

a) Introduction of the lesson

The earth in the universe

- Help them to define and become familiar with key words (terms)
- to start the lesson invite students to share ideas about the topic based on previous knowledge.
- Ask them questions to introduce the lesson and motivate them to ask and answer questions.
- To facilitate the discussion and share experience, ask students the following questions.
- What do you understand about universe and the solar system?
- How and when did the universe begin?
- Help them to come with acceptable facts and logic
- Such a first-step introduction will let you identify whether the students are well informed or not about the topic. Based on this feedback, you can adjust your presentation according to the level of the class in general.

After the first instant introduction, let the students read the information available about the topic in their textbook. Help them resolve their doubts with a short clarification. This part of the introduction will be repeated in every lesson whenever it is important.

b) Body of the lesson

Make use of figure 2.1 and discuss how the solar system came into existence.

- Scientists study the origin of the earth, looking back 4.6 billion years.
- tell them that the solar system was formed when diffused dusts and gases coalesced (came together).
- according to the big bang theory, the universe was compressed into a single infinitely dense point.
- let them discuss the nature of the point and its extra-ordinary explosion.
- The explosion, called the big bang, instantaneously created the universe. Let them appreciate that matter, energy and space came to existence in the process, and that this is also the start of time.
- in your discussion, bring to the attention of students the following points.
    1. The dust particles were made of hydrogen, helium and other elements. Note that the hydrogen made the greater part of the dust cloud.
    2. The whole dust cloud moved so rapidly in space that the particles were pulled together because of gravity, forming a big disc of dense and heavier matter.
    3. It finally divided into ringed parts the centre of which formed the sun and the outer rings which evolved into planets.
- In the process, emphasize that the earth formed in the same process in which the solar system was formed some 4.6 billion years ago. Encourage them to study figure 2.1 and describe the gradual evolution of the solar system from dust and gas to planets.

Structure of the earth

You are supposed to follow your lesson introduction as suggested as the first step of lesson presentation. However, you may choose whatever you think is appropriate for each lesson, according to the nature and conducive conditions at that specific time and place.

- Make use of figure 2.2. The structure of the Earth, and discuss it to identify each layer.
- Discuss and explain that the geosphere consists of three major layers. The outermost layer is a thin veneer called the crust. Below a layer of soil and beneath the ocean water, the crust is almost entirely composed of solid rock.
- Explain the composition of the mantle.

- The mantle lies beneath the crust and contains almost 80% of the earth's volume. The upper mantle consists of two layers (1) the lithosphere (Greek for "rock" layer) and (2) the Astehenosphere (Greek for "weak" layer).
- Although the mantle is mostly solid rock, it is so hot that it contains small pools of liquid rock called 'magma'.
- The third inner most layer, the core, is a dense, hot partly molten rock composed mainly of iron and nickel.

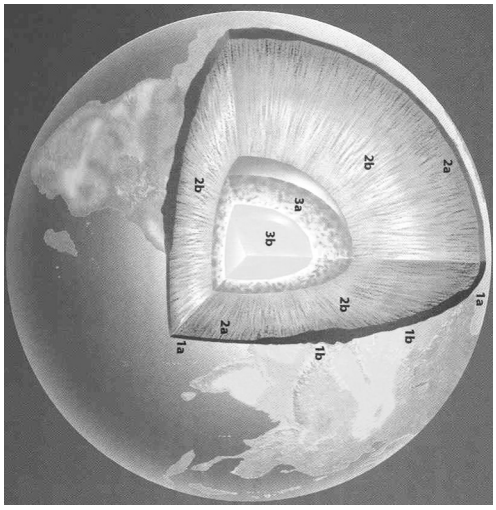


Figure 2.2 The internal structure ofthe Earth

1. **Crust** relatively speaking, this is as thin as the skin of an apple is to its flesh.
   (a) Oceanic crust (sima) is a layer consisting mainly of basalt, averaging 6-10 km in thickness. At its deepest it has a temperature of 1200°C.
   (b) Continental crust (sial) can be up to 70km thick. The crust is separated from the mantle by the Moho discontintnuity. The crust and the rigid top layer of the mantle are collectively known as the lithosphere (figure 2.2).
2. **Mantle** This is composed mainly of silicate rocks, rich in iron and magnesium. Apart from the rigid top layer (2a), the rocks in the remainder of the mantle, the **asthenosphere**, are kept in a semi-molten state (2b). The mantle extends to a depth of 2900 km where temperatures may reach 5000°c. These high temperatures generate convection currents.
3. **Core** This consists of iron and nickel, and is the size of Mars, The outer core (3a) is kept in a semi-molten state, but the inner core (3b) is solid. The temperature at the centre of the Earth (6371 km below the surface) is about 6200°C (hotter than the surface of the Sun).

The Geological Time Scale and Major Geological Events

- Start the lesson with questions.
- Make use of figure 2.3, The Geological Time Scale, and discuss how eras, periods and epochs are arranged.
- Let the students identify the different sub-division of geological time.
- In your discussion emphasize the importance of fossil remains of organisms in assisting geological time scale.
- The geological time scale is a record of Earth's history, starting with Earth's formation about 4.6 billion years ago.
- Each period of time is named based on events, fossil remains and age of rocks.

- When the ages of fossils and rock layers are determined, scientists can assign them to a specific place on the geological time scale.
- It is divided in to three sub-divisions: eras, periods and epochs.
- Generally, only the Cenozoic era is shown subdivided further into epochs. The epochs of the other periods are usually called early, middle and late.
- Explain the reason why Cenozoic era is divided into epochs, but not other eras. This is because the fossil record is more complete in Cenozoic (recent rock layers). As a result, geologists have more data with which to divide the time scale.
- In Ethiopia, mountain building during Precambrian, heavy erosion in Paleozoic, the advancing and retreating ocean water during Mesozoic, and the deformation of uplifted land and the formation of the Rift Valley during Cenozoic were the major geological events with their respective associated events.

The Movements of Continents Plate Tectonics

- Let the students discuss the start up questions.
- What is continental drift?
- What is plate tectonic?
- What makes the lithosphere plate move?
- Let them guess what they think is right and then allow them to read their text book to check their own answers.
- Explain the topic with the help of figure 2.4.
- Explain the contribution of Alfred Wegener in the movements of continents.
- In 1912, Alfred Wegener, a German scientist, proposed that all the continents were once joined in a single land mass called pangae.
- Wegener depended on fossil remains and rock formations, but in different continents, as evidence for his theory.
- Discuss and clarify how sea-floor spreading leads to tectonic plate movements and how the convection currents deep inside earth structure trigger the whole movements of the crust and become the source of many changes.
- Let students know that.
- In the 1960's geologists formulated that the sea floor is continuously spreading outward from mid-oceanic ridge system.
- This idea soon developed into plate tectonic theory in which not only the sea floor but also the entire lithosphere spreads outward from the mid oceanic ridge.
- Scientists had began to ask why the great slabs of lithosphere glide over the earth's surface.
- Recent research shows that, after suduction begins, a tectonic plate sinks all the way tot eh core mantle boundary, to a depth of 2900 kms.
- At the same time, equal volumes of hot rock rise from the deep mantle to the surface beneath a spreading center, forming new lithosphere to replace that lost to suduction.

- The process, called **mantle convection,** continually stirs the entire mantle as old, cold plates sink and hot rock rises toward the Earth's surface.
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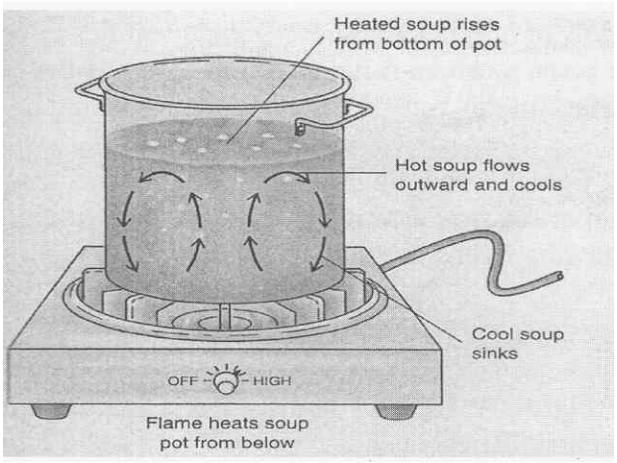


Figure 2.3 Soup convects when it is heated from the bottom of the pot

- Make use of figure2.3 (above)e and illustrate the process of convection soup as the bottom of the pot becomes warm and expands. It then rises because it is less dense than the soup at the top. When the hot soup reaches the top of the pot, it flows along the surface until it cools and sinks.
- Although the mantle is mostly solid rock, it is so hot that, over geological time, it can flow slowly, at rates of a few centimetres per year. Just as the soup on the stove rests on the hot burner, the base of the mantle lies on-and is heated by-the hotter core. Thus, heat from the core, supplemented by additional heat generated by radioactivity within the mantle drives the entire mantle and Lithosphere in huge cells of convecting rock.
- A tectonic plate is the upper portion of a convecting cell and thus glides over the asthenosphere as a result of convection (figure 2.3).

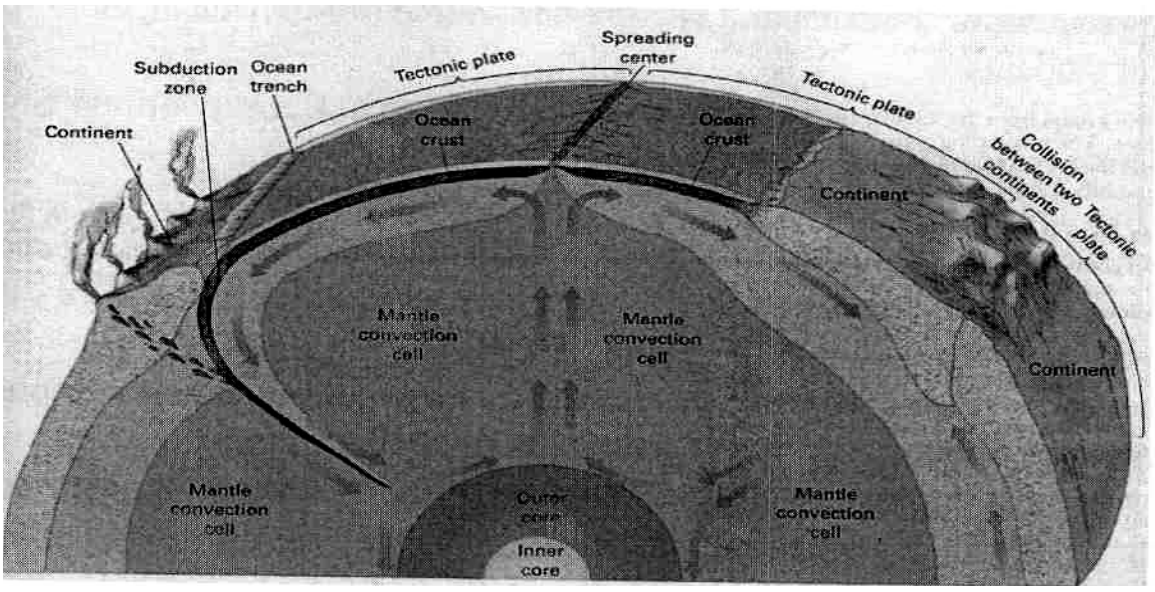


Figure 2.4 Tectonic plates form the uppermost portion of gaint convection cells that circulate through the entire mantle

- The upward flow of hot rock transports great qualities of heat from the Earth's interior to its surface, where it radiated into space. If the mantle did not carry heat to the surface in this way, the Earth's interior would be much hotter than it is today.
- Make use of figure 2.3 and figure 2.4 and explain the analogy how the soup convection works in a similar way in the mantle convection.
- Use a chart drawing figures for both to facilitate the lesson.

Components of the Earth's Physical Environment

- Give a quick preview about the four components of the earth's environment.
- The lithosphere consists of the three layers: crust, mantle and core.
- The hydrosphere includes all the earth's water, which circulates among oceans, continents and the atmosphere.
- The atmosphere is a mixture of gases, mostly nitrogen and oxygen.
- The biosphere is the zone inhabited by life. It includes the upper most geosphere, the hydrosphere and the lower parts of the atmosphere.

The Earth's radius is about 6400 kilometers. Despite this geat size, nearly all of our direct contact with the Earth occurs at or very near its surface. The oceans make up most of the hydrosphere. Nearly all of the atmosphere lies within 30 kilometers of surface, and the biosphere is thin shell about 125 kilometers thick.

The lithosphere – the lithosphere consists of three major layers.

The **crust** – the outermost layer is a thin layer. Below a layer of soil and beneath the ocean water, the curst is composed almost entirely of solid rock.

The **mantle** lives beneath the crust and contains almost 80 percent of the Earth's volume.

The third and inner most layer is a dense, hot, partly Molten core composed mainly of iron and nickel.

The **Hydrosphere** – the hydrosphere includes all of the Earth's water which circulates among oceans, continents, and the atmosphere.

The **atmosphere** – is mixture of gases, mostly nitrogen and oxygen, with smaller amounts of argon, carbon dioxide, and other gases. It is held to the Earth by gravity and thins rapidly with altitude. Ninety-nine percent is concentrated in the first 30 kilometres. The atmosphere supports life because animals need oxygen and plants need both carbondioxide and oxygen. In addition, the atmosphere supports life indirectly by regulating climate.

The Biosphere – is the zone inhabited by life. It includes the uppermost geosphere, the hydrosphere and the lower parts of the atmosphere.

Rocks

- Allow students to explore their environment (School compound) and discuss the four components of the earth.
- Let the students read and discuss rocks
- In the discussion, ask them to sort out the causes of variety of rocks.
- Discuss how sediments change into hard rock.
- There are three major rocks: igneous, sedimentary and metamorphic
- Explain how these major rocks differ in their formation.
- Make use of figures 2.6, 2.6, and 2.8, for further explanation.
- Let them identify the different types rocks available within the three major types of rocks.
- Make use of figure 2.11, Distribution of the major types of rocks in Ethiopia, and discuss their distribution in associations with regions in Ethiopia.

Rocks of the Precambrian era are found beneath all other rocks, forming the foundation rocks, referred to as **basement complex**. They were formed more than 600 million years ago. The rocks of this era are also collectively described as crystalline rocks. The basement rocks of the southern and eastern parts of the country were more strongly metamorphosed than those found in the north.

Rocks palaeozoic in Ethiopia are marked by a regional uncofromity due to persistent erosion. Rocks of Mesozoic era were deposited during the period of subsidence of the land and transgression of the sea. They are mainly sediments such as sandstone, limestone and gypsum. They cover the whole of the eastern lowlands, large areas of Harar, Bale, Borena and Tigray.

Rocks of Cenozonic era consists of Cenozonic sedimentary and Cenozonic volcanic rocks. Sedimentary rocks of the Cenozoic era cover eastern Ogaden, the Denakil Depression, and the lower OMO valley. Highland Ethiopia is underline by Tertiary volcanic mostly basalt. The Rift valley is underlain by Tertiary and Quaternary volcanic and sediments.

Soil

- Is another important part of the lithosphere and should be addressed in depth to cultivate the student's understanding of its importance in our life.
- Follow the same procedure as we did in our first sub-unit lesson introduction.
- Ask students the question: Where does soil come from?
- Discuss and explain factors that control soil characteristics.
- Make use of figure 2.12 to explain soil texture.
- Explain the major soil types in Ethiopia.
- Make use of figure 2.13 to explain about major types of soil in Ethiopia.
- Define *soil degradation and conservation*, one of a time, and emphasize the causes of soil degradation.
- Land is assumed to be degraded when it loses its quality of life, vegetation and potential for production capacity.
- Let students discuss and identify the major causes of land degradation.
- Explain the contribution of peoples' activity in soil degradation.
- Let students discuss and identify the role of deforestation in land degradation.
- Explain types of erosion: sheet erosion, rill erosion, gully erosion and wind erosion.
- Make use figure 2.14 figure 2.15 figure 2.16 to support your explanation.
- Help them to identify the different types of soil conservation methods.
- Make use of figure 2.17, 2.18, 2.20 to support your explanation.
- Help them to work on activity 2.6.

c) Stabilization

The birth of our solar system began as dust and gases (nebula). Repeated collision caused the dust particles to change into planets in million years time.

- The earth is one of the nine planets that, along with the others, revolves around the sun
- The earth's origin is related to the process of formation of the solar system.
- The earth is composed of a great central core and a series of surrounding layers, collectively known as mantle, and crust.
- Geologists estimate that the earth formed 4.6 billion years ago.
- All divisions in the geological time scale are based on changes in existing fossils of organisms
- During the Precambrian era, Ethiopia was made up of huge mountains which were folded and faulted.
- Continental drift theory suggests that continents were once joined together and later split and drift apart.
- The earth system can be divided into four physical systems: the atmosphere, the lithosphere, the hydrosphere and the biosphere.

- Rocks are naturally formed solid that is an aggregate of one or more different minerals.
- Igneous rocks cover large areas of the central part of Ethiopia.
- Soil is a complex mixture of inorganic minerals, decaying organic matter, waters air and living organisms.
- In the case of good quality soil the organic materials, water and soil, account 45%, 25% and 5% respectively.
- Some of soil conservation methods in Ethiopia include contour ploughing, strip cultivation and terracing.
- Water erosion is the main cause of soil erosion in Ethiopia.

4.5 Evaluation and Follow up

a) Evaluation

Ask students the following questions.

1. List and briefly describe each of the Earth's four realms.
2. List the three major layers of the Earth. Which is/are composed of rock, which is/are metallic? Which is the largest; which is the thinnest?
3. How old is the Earth? When did life first evolve? How long have humans and their direct ancestors been on this planet?
4. What are the three main kinds of rock in Earth's crust?

b) Follow up

- Let the students work on the following exercises (Exercise 2.1 – 2.9) with your control supervision and assistance.

c) Additional Activities

I Answer the following questions

1. What contribute for the disappearance of a large lake in Afar depression?
2. What is loam?
3. What is leaching?
4. What is humus?
5. Name the four basic ingredients in soil
6. If you were a crop farmer, what kind of soil would you want on your farm? Give as complete a description as possible.

4.6 Answers for Activities

Activity 2.1

1. The sun
2. Milk way

Activity 2.2

Part I

1. e 2. b 3. d 4. f
5. c 6. a

Part II

7. Mantle 2. Crust 3. Core
8. the increase in temperature and pressure with depth
9. The sun and the mine planets and all other objects that revolve around the sun 10. 6000^{o}C
11. earth's rotation, revolution and tilt.

Activity 2.3

I Give short answer

1. Mesozic: Adigrat sandstone, Hintalo limestone, upper sandstone
2. Paleozoic

II Match the words in column B with the phrases in column A

3. E 4. C 5. B 6. D 7. F 8. A

III Critical Thinking

9. A rift valley develops in a continental rift zone because continental crust stretches, fractures, and sinks as it pulled apart. Continental rifting is now taking place along the East African rift. If the rifting continues, eastern Africa will separate from the main portion of the continent, and a new ocean basin will open between the separating portions of Africa.
10. Le t the students write about the regions unstable condition based on:
    i. the recent continuous minor earth quake events as reported by mass media.
    ii. the live Artale active volcanic activity which become a centre of attraction worldwide.
    iii. the news report that confirms about the occurrence of eight meters wide rift in Afar due to the internal movement of the earth.

Activity 2.4

Rock properties

Crystalline structure – A crystal in any substance whose atoms are arranged in a regular repeated pattern.
Cleavage – is the tendency of some minerals to break along flat surfaces. Some minerals, like the micas, have excellent cleavage. You can peel sheet after sheet from a mica as if you were peeling layers from an onion.
Fracture – is the manner in which minerals breaks other than along planes of cleavage.
Hardness – Hardness is the resistance of a mineral to scratching. If the blade of a knife scratches the mineral, the mineral is softer than the knife. If the knife cannot scratch the mineral, the mineral is harder.

Luster – is the manner in which a mineral reflects light. Minerals with a metallic luster are shiny, like metals. Minerals with a non metallic luster are dull, and described as glassy, waxy, earthly, oily or silky.

Permeable – that can allow water through its pores.

Color – would be a reliable identification tool if all minerals were pure and had perfect crystal structures. If a mineral is exposed to weather, it can become discolored

Activity 2.5

Part I

1.	Luvisols	2.	Fluvisols	3.	Lake areas
4.	Loam	5.	Metamorphic	6.	0.63%

Part II

7.	Clastic	8.	Igneous	9.	Sedimentary

Activity 2.6

I Give short answers to the following questions

1. It is a change in the state of soil due to increased erosion, leaching and both processes. Badly eroded soil has lost not only all of its top soil but also lost some of its sub soil.
2. Physical cause – steepness of slope, intensity and seasonality of rainfall soil type and vegetation cover.
   Human causes – deforestation, overgrazing and bad farming practices.
3. a. water b. wind
4. Renewable resource – A resource that can be replaced in a short period of time - example – forest, soil, water
   Non renewable resource – A resource that cannot be replaced within a short period of time or at all example – minerals, oil
5. Contour ploughing, terracing, strip cultivation

II Discuss these issues

1. Reforestation refers to planting trees in areas where forests were cleared, and afforestation is the covering of the area with seedlings which does previously support forest.
2. Reforestation and afforestation
   - covering the soil with vegetation.

Answers Key for additional activities

1. In the quaternary period the prevalence of dry climate with continuous rate of evaporation discourage rivers flowing into the lake and make it disappear.
2. It is a mixture of sand and silt with only a little clay. Such a soil mixture is called a loam.
3. Leaching is the dissolving of plant nutrients in water that carries it downward through the soil beyond the reach of most plant roots.
4. Humus is any organic matter (material from living or dead plants or animals) in the soil.
5. i. rock particles ii. Water iii. Air iv. Humus

2.2 CLIMATE

Periods Allotted: 6

1. Competencies

Upon the completion of the lesson students will be able to:

- *Realize the criteria used for classifying climate;*
- *compare the climatic classifications of the Greeks and Khoppen's;*
- *explain causes of climate change;*
- *explain major consequences of climate change.*

2. Content

2.2.1 Classification of climate of the world.

Commonly used criteria for classifying climate

- **The Greek's**
- **Khoppen's**

2.2.2. Climate change

- **Causes of climate change**
- **Consequences of climate change**

3. Overview

2.2.1 CLASSIFICATION OF CLIMATE OF THE WORLD

The need for classification of climates emerges from the complexity and variety of the nature of climate. The classification is an attempt to reduce the innumerable local climates to manageable one. There are relatively few groups that have important common characteristics.

It is possible to make generalizations about the climate of the place or are i.e the average, or 'normal' conditions over a period of time (usually 35 years).

In seeking a sense of order, the geographer tries to group together those, parts of world that have similar measurable climatic characteristics (temperature, rainfall distribution, wind etc) and to identify and to explain similarities and differences in spatial and temporal distributions and patterns.

The early Greeks divided the world in to three zones based up on a simple temperature description: torrid (tropical), temperate and frigid (polar); they ignored precipitation. In 1918, Koppen advanced the first modern classification of climate. To support his claim that natural vegetation boundaries were determined by climate, he selected as his basis what he considered were appropriate temperature and seasonal precipitation values. His resultant classification is still used today.

All classifications have weakness: none is perfect.

- They do not show transition zones between climates.
- They can be criticized for being either too simplistic or too complex.
- They ignore human influence and climatic change.
- Most tend to be based upon temperature and precipitation figures and neglect heat and water budgets, air mass movement and the transfer of energy.

2.2.2 CLIMATE CHANGE

The average temperature of the earth's atmosphere has risen by about 0.5^0C during the past 100 years. At the same time, mid – latitude continents have grow wetter, while the tropics have generally become drier. Continuing climate change could alter ecosystems; drive species in to extinctions, impact human settlement, food production, and the distribution of disease.

Climate change is not unique to the twentieth century. The geological record of almost every locality provides evidence that past regional climates were different from those of today.

It is clear that Earth has had changes in its average temperature many times in the geological past before humans were present. Scientists, initially tried to determine whether the warming was a natural phenomenon or the result of human activity. Several gases such as carbondixoide, chlorofluorocarbons, methane and nitrous oxide are known as greenhouse gases because they let sunlight enter the atmosphere, but slow the loss of heat from the Earth's surface.

Evidence of past climate change going back as far as 160,000 years indicates a close correlation between the concentration o greenhouse gases in the atmosphere and global temperatures.

4. Teaching-learning Process

4.1 Suggested Teaching Aids and References

- Globe
- Climate map of the world
- World atlas
- Climate-change records (books)
- Manually draw figures and charts
- Documentary films on climate change

4.2 Suggested Teaching Methods

- Brainstorming
- Explanation
- Discussion
- Question and answer
- Demonstration

4.3 Pre-lesson Preparation

- Search for the appropriate teaching material mentioned above
- Display a wall map
- Try to find a documentary film on climate change in different parts of the world.

4.4 Presentation of the Lesson

Classification of Climate

a) Introduction of the lesson

- Help them to define and teach them to become familiar with key words.
- Start the lesson with questions.
- Let the pupils share ideas about the topic. Ask them questions that are indicated in the activity, and motivate them to ask and answer questions.

- Help them to define climate and to identify the differences and relationships between weather and climate
- Let them define what classification literally means?

b) Body of the lesson

- Explain why climate classification is needed, and let the students discuss various local climate types.
- The Greeks classified the world climate zones based on temperature.
- Greeks divided the world into three climatic regions.
- Koppen climate classification is based on seasonal variation in temperature and precipitation.
- Explain the difference between the two classifications and emphasize that the Koppen classification is widely accepted nearly worldwide.

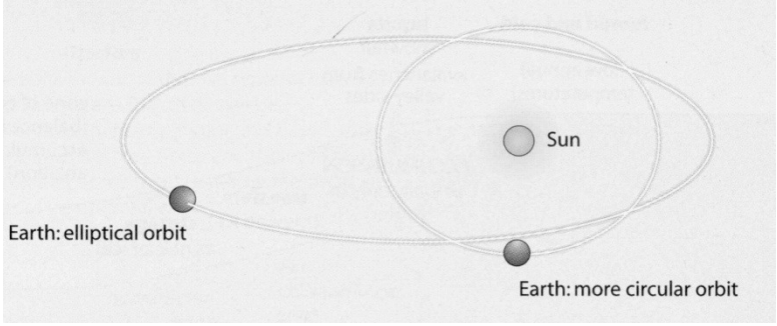
Climate Change

- Start with startup questions indicated at the beginning such as:
- What is climate change?
- Is climate change a reality?
- What causes climate change?
- Let students discuss the questions and guess what they think is right.
- Have every student give his/her own perception of climate change at this level and tell them to write their answers to the questions.
- Then tell them to exchange their answers. This will help them to share ideas and learn in a related way.
- Allow them to read their textbook about climate change.
- Let them discuss about natural and human cause climate change.
- Let the students discuss climate change caused by Milankovitch cycles
- Milankovitch cycles is named after Serbian scientist Multin Milankovitch.
- Suggest that the rotation of the earth around the sun might be responsible for cyclic weather changes.
- Explain about global warming and its effects.
- Assist them to give more attention about human cause climate change.

Milakovitch Cycle

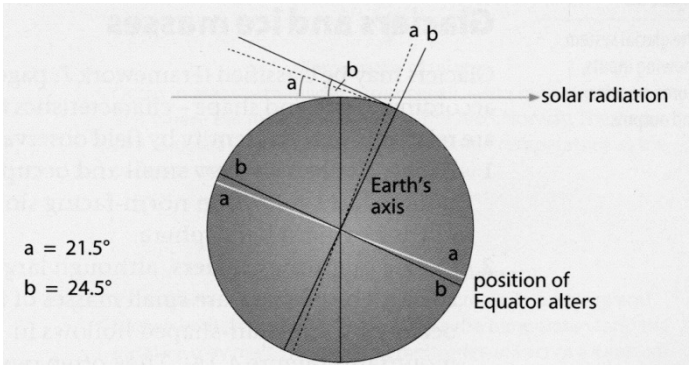
a) The 95,000 year stretch

The Earth's orbit stretches from being nearly circular to an elliptical shape and back again in a cycle of about 95,000 years. During the quaternary, the major glacial-interglacial cycle was almost 100,000 years. Glacial's occur when the orbit is almost circular and interglacial when it is a more elliptical shape.



b) The 42,000 year tilt

Although the tropics are set at 23.5°N and 23.5°S to equate with the angle of the Earth's tilt, in reality the earth's axis varies from its plane of orbit by between 21.5° and 24.5°. When the tilt increase, summers will become hotter and winters colder, leading to conditions favoring interglacial.



c) the 21,000 year wobble

As the Earth slowly wobbles in space, its axis describes a circle once every 21,000 years.

1. At present, the orbit places the earth closest to the sun in the northern hemispheres winter and further away in summer. This tends to make winters mild and summers cool. These are ideal conditions for glacial to develop.

2. The position was in reverse 12,000 years ago and this has contributed to our present warm 'interglacial'.

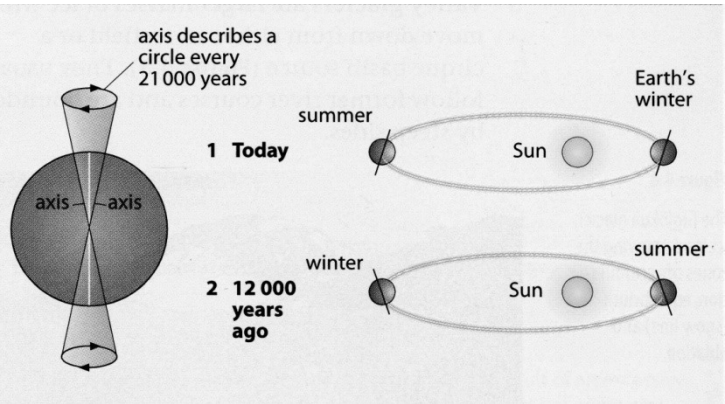


Figure 2.4 The orbital forcing mechanisms of Milankovitch's climatic change theory

- Help the students identify the four major green house gases.
- Explain the normal carbon cycle between the earth's surface and the atmosphere and emphasize what happens when it exceeds the normal or natural process in the cycle.
- Use figure 2.24 to explain the analog between green house and the atmosphere crowded with green house gases and the green house effect.
- Let the students discuss the impact of climate change and related outcomes.
- Allow them to discuss questions in the activities.
- Select some students and allow them to present their views and findings in class.
- Help them how to organize their own science/ Geography Journal/.

c) Stabilization

The need for classification of climates emerges from the complexity and variety of the nature of climate. The early Greeks divided the world into three zones based on a simple temperature description. Koppen classification considered the first modern classification of climate.

The causes of climate change can be divided as natural causes and those that are created by man.

The earth's climate is dynamic and always changing through a natural cycle.

Global warming is the increase in the average temperature of Earth's near surface air and oceans since the mid – 20^{th} century.

4.5 Evaluation and Follow up

a) Evaluation

Ask questions such as

- what are elements and controls of climate?
- why is climate classification needed?
- what is the base for Koppen's climate classification?
- what are the causes of climate change?
- enumerate the green house gases.
- what are the predicted climate changes at present?

b) Follow up

- Let them draw a globe and show the Greeks climate classification
- Ask them to explain about greenhouse effect.

c) Additional Activities

I Answer the following questions

1. What are the two known climate classifications of the world?
2. Which greenhouse gas is strongly related with the burning of fossil fuels?
3. What are the three important sources for the emission of methane?
4. Write three negative results of global warming.

4.6 Answers for Activities

Activity 2.7

a. City 1 Humid tropical climate
   - High rainfall and high temperature

   City 2 Desert
   - High temperature
   - Low rainfall

b. City 2 c. City 2 d. City 2

e. City 1 f. City 1

Activity 2.8

1. Climate change is a long-term change of weather conditions that cover many million years. Climate variability refers to the instable condition of the atmosphere leading to variations in weather and climatic conditions. Some of the effects include a rise sea-level, shift of tropical zone, expansion of tropical diseases and loss of biodiversity.

Answers Key for additional activities

1. The Greek's and koppen climate classification
2. Carbondioxide
3. from – animals
   - rice fields
   - fertilizer application
4. Drought
   Rise in sea level
   Biodiversity loss

2.3 CLIMATE OF ETHIOPIA

Periods Allotted: 6

1. Competencies

Upon the completion of the lesson, students will be able to:

- *Describe the spatio - temporal variation of temperature in Ethiopia;*
- *compare rainfall distribution of Ethiopia by place and time;*
- *discuss factors why Ethiopia experienced different climate from other tropical countries;*
- *differentiate climate zones of Ethiopia;*
- *explain the reasons that drought is not necessarily followed by famine;*
- *identify drought prone areas of Ethiopia;*
- *state drought coping mechanism in agriculture.*

2. Contents

2.3.1 Distribution of major elements of climate in Ethiopia
2.3.2 Major climate controls in Ethiopia
2.3.3 Major seasons and climate zones in Ethiopia
2.3.4 Drought in Ethiopia
2.3.5 Drought coping mechanisms

3. Overview

In Ethiopia the distribution of major elements of weather and climate are highly influenced by altitude. The Atlantic Ocean and Indian Ocean serve as the source of rainfall during summer, autumn and spring, respectively.

March, April and May are the warmest months throughout the country, and the coldest months are from November of February all over the country.

- Altitude affects climate in Ethiopia, and generally the higher the region, the cooler its climate.
- The traditional climate zones of Ethiopia include Berha (hot, arid) Kolla (warm to hot, semi-arid), Weina Dega (warm to cool, semi humid), Dega (cool to cold, humid) and Wurch (cold moist temperature).
- Drought in Ethiopia seems to be frequent in an interval of years and more aggravated by deforestation combined with high isolation exceeding evaporation over coming rainfall.

4. Teaching-learning Process

4.1 Suggested Teaching Aids and References

- Ethiopian map
- African map
- Documentary films on drought and drought-affected communities

4.2 Suggested Teaching Methods

- Explanation
- Discussion
- Question and answer
- Demonstration

4.3 Pre-lesson Preparation

- collect Ethiopian map
- globe
- and world map

4.4 Presentation of the Lesson

a) Introduction to the lesson

- Start the lesson with questions and let students discuss them, based on their previous knowledge.
- Allow them to discuss the questions indicated at the beginning of the lesson.

- Make use of Ethiopian and African map to introduce the position of Ethiopian in East Africa.

b) Body of the lesson

- After students try to answer the questions in with the help of Ethiopian map,
- Based on the feedback that you receive, explain how the position of Ethiopia help it receive more isolation than high latitude area.
- Explain how the position of ITCZ contribute in shaping the climate of Ethiopia.
- Then explain how altitudesinterfere with the distribution of temperature over latitude.
- Highlands have the lowest mean maximum temperature throughout the country. And the highest mean maximum temperature (40℃) occurs in the lowlands from March to June.
- Rainfall amount is highest (2400 mm) over southwestern highlands and gradually decreases (to about 600 mm), over northern, northeast and south east parts of the country.

Major Climate Controls in Ethiopia

- Explain the role of altitude over latitude in the climate of Ethiopia.
- underline that altitude is the most important control of climate in the high land part of Ethiopia.
- Ask questions indicated at the beginning of the lesson.
- Let the students discuss and come with their own conclusions.
- Explain and describe the role of cloud cover in shaping the climate nature of Ethiopia.
- Altitude, latitude and cloud cover affect the annual average temperature.
- Make use of table 2.1 and discuss how altitude affects climate in the case of five cities.

Seasons in Ethiopia

- Discuss how the ITCZ migration affect wind flow in the region and become the cause of rainfall to be variable and seasonal in Ethiopia.
- Make use of figure 2.28 (Rainfall Regions of Ethiopia) and discuss differences between the rainfall regions.
- Make use of Table 2.2 to explain the temporal distribution of the main seasons in Ethiopia.
- Help students to understand the climate of Ethiopia based on koppen classification.

- Explain the five traditional climatic zones in Ethiopia.
- Their classification is based on temperature and altitude.
- Make use of table 2.3 and let the students discuss traditional climatic zones in Ethiopia and share experience.

Drought in Ethiopia

- Allow students to discuss on questions as an introduction to the lesson.
- Define *drought* and explain its impact on human and animal life.
- Help them to identify the three main types of drought.
- Make use of figure 2.29 to explain drought prone areas in Ethiopia.

Causes and Consequences of Drought

- Drought is the result of natural and human factors.
- It is mentioned in historical records and repeats in a cyclic pattern.
- the previous drought-occurrence interval of every 10 years is now reduced to two years. The above fact shows the less interval it has, the more complete and action are the factors that drive drought conditions.
- Let the students appreciate that drought can happen in developed and developing nations, and help them to identify the differences between developed and developing nations in their capacity to mitigating and adapting to the impacts of drought. Poor nations have less potential and capacity to reduce the impacts of drought than do rich counties.
- Let the students work on figure 2.29 and identify drought affected areas in Ethiopia.
- Let the students discuss the questions of how to fight drought and share ideas about some local mechanisms that their local people practices.
- Explain some of the practices appropriate for combating drought, like reforestation, storage of water, resettlement and others.

c) Stabilization

Ethiopia lies within the tropics, a zone of maximum insolation, where every place has over head sun twice a year.

- Ethiopia's annual temperature range is highest in the lowlands, and it decreases with altitude.
- Rainfall is seasonal, varying in amount over space and time.
- Highlands receive widest coverage of keremt rain and the eastern escarpments and associated lowlands remain dry.
- Ethiopia's most important climate control are altitude, latitude and could cover.

- Ethiopia has five major traditional climate zones: *bereha*, *kola*, *woinadega*, *dega* and *wurch*.
- Drought is a condition that happens when much less rain is received than expected.
- Although famine and starvation can result from drought, they are not its necessary consequences.
- High drought probability zone in Ethiopia include part of the Somali and Afar regions, part of Tigray, eastern Amhara and southern part of the Oromia region
- Some of drought-copying mechanism in Ethiopia are: careful planned land use, planting crops of low – water dependency, rain water harvesting and planting trees in degraded areas.

4.5 Evaluation and Follow up

a) Evaluation

Ask questions such as:

- why do we consider Ethiopia a tropical country?
- what is the impact of its location on is climate?
- what are the major climate controls in Ethiopia?
- enumerate areas located in high drought prone zone in Ethiopia.
- you may add more questions that you think are appropriate in evaluation the sub-unit.

b) Follow up

- let the pupils try questions that are available in activity 2.9, 2.10 and 2.11.

c) Additional Activities

1. Among the major controlling factors of climate, which one is the strongest in Ethiopia? Why?
2. Describe briefly some of the advantages of temperature zones (like Bereha, Kolla, etc.) for Ethiopia.

4.6 Answers for Activities

Activity 2.9

1. $3^oN – 15^oN$ and $33^oE - 48^oE$
2. Red sea and Indian ocean
3. Rift valley
4. Hot tropical climate
5. The climate is not uniform, there is great variation between lowlands and highlands
   - It shaped by altitude
     Yes, Kermet rainfall is associated

6. The equatorial westerlies winds are dominant during summer which is the major rainfall season in Ethiopia. Regarding the distribution, more rainfalls are recorded in south-western part of the country and thin out along the other parts.

Activity 2.10

Part I

1. Wurch, Dega, Woina Dega, Kolla, Bereha
2. Summer – Keremt autumun – Tseday
   Winter – Bega Spring – Belg
3. Yes, there is a great difference between them. The kola people, are more inclined to pastoral farming growing climate crops such as, cotton, maize, sorghum etc, where as Dega people are engaged in mixed farming and grow crops of temperate climate like Teff, wheat, barely etc. In Kolla people usually dress light clothes and Dega people mostly use heavy cotton woven shema clothes to make themselves comfortably warm.
4. No, Because Kolla plants and grasses grow faster than Dega plants due to the warm climate

Part II

5. Mean Maximum 23.67^{o}C
   Mean Minimum 11.01^{o}C
6. 17.37^{o}C
7. Warm = March, April, May
   Coldest = July, August, December
8. a. November
   b. 12.66^{o}C
9. 1175mm
10. Driest = December, November, February

    Wettest = August, July, September

Activity 2.11

1. A nation which remain under famine for so long will be affected psychologically and its people may loose confidence to act and to take decision.
2. Afar, Tigray, eastern Amhara, and southern part of Oromia
3. Because It is they are in all – year round rainfall region and receive abundant moisture
4. Part of Somalai, Oromia, Afar eastern part of Tigray and Amhara.
5. Natural – when rain forming conditions are not met.
   Human – over cultivation, deforestation overgrazing and excessive erosion
6. Drying up of surface and sub surface water sources
7. - Planting trees in degraded areas

- Maintaining reserves of food and other facilities
- Limiting house hold size
- Encouraging farmers to grow drought resistant crops

8. - Planting trees
   - the introduction of water and soil conservation programme
   - Rain water harvesting

9. - encourage planting trees in degraded areas
   - raise public awareness to promote carefully planned land use
   - promote rain water harvesting and storing
   - plan resettlement to drought victims

10. I don't think that is a solution. Instead there should be a policy that encourage people to work hard and be creative to become self reliance.

11. Aid and development aid are both life and economic support schemes that come from donor countries. Aid is short term life supporting programme that bring relief to the victims of drought or some other natural hazards. Development aid is a long term economic programme that bring knowledge, skill and technology transfer to the host country to solve the existing problem in a sustainable way.

12. Development and is more important that it will assist the aid received country to solve its problem in a planned and sustainable way.

Answers Key for additional activities

1. Altitude is the strongest climatic controlling factor in Ethiopia. This is because, large part of the country's relief comprise highlands in the form of mountain, mountain range, plateaus, etc.
2. The mountainous nature of Ethiopia, enables it to have different agro – climatic (temperature) zones, like Bereha, Kolla Woina Dega, Dega and Wurch. These zones may create various advantages to the country. Some of them are the following;
   - The Ethiopian farmers have enabled:
     - To cultivate different types of crops (both highland crops like teff, wheat, barely, etc and low land crops such as maize, sorghum, etc) and harvest them at different seasons.
     - To possess different types of livestock (cattle, sheep, goat, camel, donkey, etc)
   - The different agro – climatic zones enabled the country to possess:
     - Large varieties of biomasses
     - Different indigenous knowledge (in relation to agriculture, herbal medicines, conservation practices, etc).
     - Huge potential towards tourism industry, etc
     - Large numbers of international rivers that flow year round.

2.4 ECOSYSTEMS

Periods Allotted: 4

1. Competencies

Upon the completion of the lesson, students will be able to:

- *review the concept of ecosystem;*
- *discuss how climate affects the distribution of ecosystems;*
- *realize the effect of latitude on the variation of ecosystems;*
- *explain the role of altitude in the distribution of ecosystems;*
- *relate factors in the diversity of fauna and flora in the ecosystem;*
- *identify factors that affect soil in ecosystems.*

2. Contents

2.4.1 Factors that affect the distribution of ecosystems

2.4.2 Diversity of fauna, flora and the soil ecosystem

3. Overview

The water around you, the air above you, the rocks and soil under your feet, and all living things around you make up your ecosystem. Living things in an ecosystem depend on each other and on the non-living things around them. Animals, for example, depend on plants for food and for the oxygen plants make.

- There are many types of ecosystems even within a relatively small area.
- Temperature and rainfall have a great influence on the kind of ecosystem that develops in any part of the world.
- Sandy soils do not allow the more water-demanding species of plants to grow, while wet soils allow certain species of trees to grow.
- Desert and rainforest ecosystems are different in their climate, soil, flora and fauna types.

4. Teaching-learning Process

4.1 Suggested Teaching Aids and References

- World map
- Documentary films on variety of ecosystems
- Documentary films on equatorial rainforest and desert ecosystem

4.2 Suggested Teaching Methods

- Brainstorming
- Explanation
- Discussion
- Demonstration

4.3 Pre-lesson Preparation

Get-ready a world map African map and a documentary film that shows desert and equatorial ecosystem.

4.4 Presentation of the Lesson

a) Introduction to the lesson

Ecosystems

- To start the lesson, ask the students questions such as:
- How do living things interact with each other and their environment?
- What do living things need in order to survives?
- What is ecosystem?
- Let the students define *ecosystem,* recalling their lessons in previous classes.
- Help them do define and discuss the above questions.
- Let the students define and be familiar with key words.
- Allow them to read about *ecosystems,* specifically about the oak tree and its role in survival and interaction in the system.
- Explain how organisms interact in the ecosystem and show the students how organisms are interdependent for mutual survival.
- Help them to work on activity 2.12.
- Let them select a tree that they like and write about its interaction with its environment.

b) Body of the lesson

Factors that affect the distribution of ecosystems

- Explain the role of precipitation and temperature in creating the various vegetation types in an area.
- Areas with low moisture and low temperatures produce tundra, dry areas produce deserts and moderate rainfall supports grasslands.
- Discuss with the students the role of soil in vegetation distribution.

Diversity of Fauna Flora and the Soil of Ecosystems

- Discuss how diverse ecological systems come into existence.
- Explain the role of climate, soil and relief in producing variety of fauna and flora.
- Make use of world and African maps to discuss and locate the different ecosystems.
- Explain how Sahara Desert was formed and describe its climate characteristics.
- Explain how various plants develop a natural mechanism to resist and survive or adapt to the variety of climate in various ecosystem.

- Describe the animal types that exist in tundra, rainforest, grasslands and coniferous forest.
- Make use of figure 2.30 and figure 2.31 and discuss the relationship between altitude, latitude and vegetation.
- Explain the climate, soil types, plant and animal life in the equatorial rain forest.
- Explain the importance of rainforest as a carbon sink.
- Let the students discuss the global rainforest services and the problem rainforests face because of commercial forestry.
- Allow them to discuss the importance of rainforests and the alarming danger they face these days.

c) Stabilization

An ecosystem is all the living and nonliving things in an area interacting with each other. Each organism contributes something to the others in the ecosystem.

- Precipitation and temperature are major factors that determine the vegetation in an ecosystem.
- Among many factors that shape the type of Fauna, Flora and soil type of ecosystem, climate plays a decisive role in their distribution and activities.
- Latitude affects the distribution of vegetation and as a result low latitudes support equatorial forests where as polar areas entertain tundra vegetation.
- Because of the effect of altitude vegetation variation is similar when we travel up a mountain as one would travelling from the equator to the North pole.
- Climate is the main factor that facilitate the development of soils in different ecosystems.

4.5 Evaluation and Follow up

a) Evaluation

Ask questions such as:

- What is ecosystem?
- What are the components of ecosystem?
- Why is equatorial forest rich in its bio diversity?
- Provide them more questions that are important in evaluating the sub-unit.

b) Follow up

- Let the students work on activity 2.12.

c) Additional Activities

I Answer the following questions

1. What are the two factors that determine vegetation distribution in an ecosystem?
2. Which areas have uniformly warm, relatively unchanging temperatures throughout the year?
3. Why is the soil of a tropical rainforest usually infertile?

II Decide whether the statement is True or False

4. As height above sea level increases, the average temperature decreases
5. Tropical mountains like Mt. Kilimanjaro have snow on top of their summit.
6. Water scarcity is typical desert character

III Match the following biome indicates as, A, B, C, D, E, F with items listed from number 6 – 11

A. Tundra B. Grassland C. Deciduous D. Taiga

E. Tropical forest F. Desert

6. Savanna
7. tree less plain
8. trees shed their leaves during winter
9. greater diversity of species
10. ephemerals
11. short, cool summers and long winters

4.6 Answers for Activities

Activity 2.12

Part I

1. Through their small leaves
   - Plants like cactus have the ability to store water
   - Some are flowering when rainfalls
2. Due to lack of moisture and vegetations
3. Mosses and lichens

4. Grazing animals – caribou, Muskox, arctic hare
   Predators – Arctic foxes, Wolves and owls
5. Lengthy drought that alternate with wet season
6. Deciduous

7. This is because of the climate of the coniferous forest (i.e short cool summer and longer winter) is greatly influenced the speed of nutrient transfer. For instance, the needle leaves and litter from the coniferous trees are slow to decay. When they do so, they form an acidic humus. The A horizon of a podsol, which lies beneath the litter and humus layers, becomes bleached to an ash-grey or whitish colour and is infertile, as many of the minerals needed for plant growth have been removed. This severely restricts the variety of plant species able to grow here. Those that do occur, such as conifers, are those species that require few nutrients..
8. Because the abundant moisture tend to carry away nutrients before mixed with the soil.
9. Mahogany, ebony, iron wood, teakwood
10. Soils in equatorial rainforest region are infertile and poor in their humus content. Due to the high temperature and heavy rainfall soluble minerals and nutrients are rapidly leached away by the percolating rainwater.
    In tundra the climatic conditions make the sub soil permanently frozen as permafrost. The lack of oxygen in waterlogged conditional restricts bacterial action so that remains of the tundra vegetation only partly decompose and accumulate as a layer of peat, stained black by acid humus.
11. Barren regions – because ice and snow remain all year and it is impossible of plants grow. The largest barren regions are the ice-cap climate regions of Antarctica and Greenland.

Part II

12. Due to lack of moisture and vegetation in hot desert areas there has been little true developments of soil, the surface consists of sand and pavement of bare rock, whereas in equatorial forest region soils are usually poor in nutrients because rain water tends to carry away most nutrients because it is relatively warm and continuous.
13. A. - Cutting trees to secure agricultural land
    - Illegal logging

    b. United Nations held conferences that discussed on such issues to create awareness among member nations.
    - Scientists conduct research studies that show the danger of deforestation imposed on rainforest.
    - Nations are establishing environmental protection agencies to minimize the problem and to dress a sense of responsibility.

    c. Let the students forward their view about their prospective contribution.

Answers Key for additional activities

Part I

1. Temperature and precipitation
2. Equatorial rainforest region
3. In tropical rainforest the lack of a thick layer of decaying organic matter on top of the soil, along with the large amount of precipitation to leach the soil, make the ground infertile.

Part II

4. True 5. True 6. True

Part III

7. B 8. A 9. C 10. E 11. F 12. D

Answers for Review Questions on Unit 2

I Match the Descriptions Given Under Column "A" with the Terms Listed Under Column "B"

1. h 2. b 3. g 4. m 5. i 6. k 7. l 8. A
9. e 10. o 11. f 12. d 13. c 14. j 15. N

II Choose the Word or Phrase that Best Answer the Question

16. C 17. A 18. B 19. B 20. B 21. B 22. C 23. C 24. D
25. B 26. B 27. B 28. C 29. B 30. C 31. C 32. C 33. C
34. C 35. B 36. C

III Define the Following Terms

a. Pangaea: Greek root words for "all lands". A continent consists of all or most of the earth's continental crust after Wegner map.
b. Tectonics: A branch of geology dealing with the broad architecture of the outer part of the Earth: specifically the relationships, origins, and histories of major structural and deformational features.
c. Transform boundary: A boundary between two lithospheric plates where the plates are sliding horizontally past one another.
d. Biosphere: The zone inhabited by life.
e. Compaction: Tighter packing of sedimentary grains causing weak lithification and a decrease in porosity, usually result from the weight of overlying sediment.

f. Divergent boundary: The boundary or zone where lithosphere plates separate from each other.
g. Extrusive rocks: Type of igneous rock with fine grained texture that is formed as lava cools quickly at or near the Earth's surface.
h. Sedimentary rock: A rock formed when sediment is solidified/lithified/.
i. Cementation: The process by which clastic sediments is lithified by precipitation of a mineral cement among the grains of the sediment.
j. Hydrosphere: All of the Earth's water which circulates among oceans, continents and the atmosphere.
k. Lithosphere: The cool, rigid, outer layer of the Earth, about 100 kilometres thick, which includes the crust and past of the upper mantle.
l. Anthracite: A kind of coal. It is hard, black, and shiny and is the purest form of coal with more than 90 percent carbon.

IV Answer the Following Questions. Support Your answer With Reasons Appropriate to the Issue

37. Because they are serving as carbon sink and minimize carbon concentration in the atmosphere.

38. Yes. The oceans also serve as carbon sink because the photplankton in ocean conduct photosynthesis like land base plants.

39. Because

    i. Cutting trees to secure agricultural land

    ii. Illegal logging

40. Because the organic matter is decomposed quickly and leached away by abundant rainfall and is consumed by a large army of insects before it becomes mature and part of the soil.

V Study the rainfall map of Ethiopia in association with the political map and Figure 2.28 and answer the following questions

41. The south western part of the country and north east and east part respectively.

42. In which rainfall regime are the following towns located.

a.	Most of the year rain	f.	Summer and spring rainfall
b.	Summer pronounced rainfall	g.	Most of the year rain
c.	Summer pronounced rainfall	h.	Summer pronounced rain
d.	Summer pronounced rainfall	i.	Most of the year rain
e.	Spring and autumn rain	j.	Spring and autumn rain

Check List

Check the student's performance according to the given competencies referring the questions under the check list for every unit. Put a tick (✓) mark against each task weather they are able to perform in the competencies of each unit. The students are expected to respond saying Yes or No. then, you can make your own evaluation whether the competencies are met or not.

Can you:

	Yes	No
1. Discuss the concept of universe?----------		
2. Identify the position of the earth in the solar system?----------		
3. Explain the origin of the earth? ----------		
4. Demonstrate the structure of the earth? ----------		
5. Describe the geological time scale and major events? ----------		
6. Realize the major geological events of Ethiopia? ----------		
7. Describe the concept of continental drift? ----------		
8. Distinguish the components of the earth's physical environments? -------		
9. Discuss about major components of lithosphere? ----------		
10. Define rock and describe the characteristics of each type of rocks? ------		
11. Based on their formation ----------		
12. Demonstrate the distribution of major rocks in Ethiopia? ----------		
13. Define soil and identify types and formation of soil? ----------		
14. Sort out the composition of soil ----------		
15. List the major soil types of Ethiopia ----------		
16. Analyze the ways of soil conservation in Ethiopia ----------		
17. State causes and impacts of soil degradation in Ethiopia? ----------		
18. Realize the criteria used for classifying climate? ----------		
19. Compare the climatic classifications of the Greek's and Khoppen's? ---		
20. Explain and express causes and consequences of climate change? ------		
21. Describe the spatio temporal variation of temperature in Ethiopia? ------		
22. Identify factors responsible for Ethiopia to experience different climate from other tropical countries? ----------		

23. Differentiate climatic zones of Ethiopia? ----------		
24. Appreciate the various climate conditions prevail in Ethiopia otherwise in tropical and temperate zones? ----------		
25. Explain the reasons that drought is not necessarily fallowed by famine?		
26. Identify drought prone areas of Ethiopia? ----------		
27. State drought coping mechanism in agriculture? ----------		
28. Give reasons how climate affects the distribution of ecosystem? --------		
29. Realize the effect of latitude on the variation of ecosystem? ----------		
30. Explain the role of altitude on the distribution of ecosystem? ----------		
31. Relate factors that affect the diversity of fauna and flora in the ecosystem? ----------		
32. Identify factors that affect soil in the ecosystem? ----------		

Unit Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly.

Thus

A student at a minimum requirement level will be able to discuss the concept of universe and identify the position of the earth in the solar system. Explain the origin of the earth and demonstrate the structure of the earth. Describe the geological time scale and major events and realize the major geological events of Ethiopia. Describe the concept of continental drift theory. Distinguish components of the earth's physical environments & discuss the major components of lithosphere. Define rock, describe its characteristics by types, classify rocks based on their formation, and demonstrate major rock distribution in Ethiopia. Define soil, identify formation and types of soils and list the major soil types of Ethiopia. State causes and impacts of soil degradation in Ethiopia and analyse ways of soil conservation in Ethiopia. Realize the criteria used for classifying climate, compare climatic classification of the Greek's and khoppen's. Express causes of climatic change, Explain major consequences of climatic change. Describe and compare the spatio-temporal variation of temperature and rainfall in Ethiopia, discuss the unique climatic experience of Ethiopia compared to other tropical countries. Differentiate climatic zones of Ethiopia, Explain the reasons that drought is not necessary followed by famine, and state drought coping mechanisms in agriculture. Review the concept of ecosystem and realize the effect of latitude and altitude on the variation of ecosystem. Relate factors that affect the diversity of fauna and flora in the ecosystem in the ecosystems.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to evaluate the convergence, divergence and transgress of continents in relation to the continental drift theory. Associate the distribution of major rocks of Ethiopia with its major geological events and state major soil characteristics of Ethiopia and suggest varied ways of soil conservation for each human intervention in urban and rural areas, in agricultural and industrial sectors. Compare and contrast the contribution of natural human factors for the aggravation of climatic change in Ethiopia. Argue for against various possible mechanisms of food self-sufficiency programs.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue and achieve more.

Unit 3 WORLD POPULATION

Total Periods Allotted: 15

1. Unit Introduction

Unit three has five parts. The first part, section 3.1, introduces the historical background of the size and trend of world population growth.

Section 3.2: describes in detail the components of population change. It presents how fertility, mortality and migration affect the size of human population through space and time.

Section 3.3: presents about population structure. It includes detailed information about the issues of population pyramid's shape based on age and sex. In addition, it deals with the economic implications of the three age groups both in the developed and developing countries.

Section 3.4: presents the spatial distribution of world population. It elaborates more specifically the major densely and sparsely populated areas of the world with associated factors. Crude and agricultural densities are also included as a causes of population densities. The last part of this section deals with the main demographic features of population in Ethiopia.

Please motivate your students actively to interact and give them enough time to grasp the topics. Also, be sure that they give full attention to the whole activities included in the unit. Because they give your students the chance to practice what they learn.

2. Unit Outcomes

After completing this unit, students will be able to:

- *Understand and interpret size and trend of population growth of the world*
- *state the components of population change and compare the characteristics of population structure between developed and developing countries*
- *show factors affecting spatial distribution of population and compute population densities*
- *recognize and appreciate the process and development of urbanization*
- *explain the general characteristics of population of Ethiopia.*

3. Main Contents

3.1 SIZE AND TREND OF WORLD POPULATION GROWTH

Periods Allotted: 2

1. Competencies

At the end of this lesson, students will be able to:

- *Compare population sizes of the world on continental bases*
- *identify three leading populous countries in each continent*
- *describe population growth trend of the world to show doubling time*
- *compare population trends between Africa and Europe.*

2. Contents

- **World population growth trend**
- **Doubling time and growth rate**

3. Overview

During most of the early period, global population was very low and its growth was greatly dictated by factors like climate, diseases, food supply and war. But after the 17th century, the world population started to increase rapidly and became more accelerated after the 1950's due to great improvements in medicine costs, agricultural and transportation technologies. Currently, both the total population and the rate of population growth are much higher in the less-developed countries than in the more developed ones.

4. Teaching-learning Processes

4.1 Suggested Teaching Aids

Your are expected to use the different population tables and figures indicated in the text book, map that shows population distribution of the world, population atlas of the world and you have to refer to population geography book (by M.E witheric) in order to get more related figures.

4.2 Suggested Teaching Methods

In this lesson, you are required to apply the appropriate teaching methods such as brainstorming, independent task and group discussion.

4.3 Pre lesson Preparation

Before starting the discussion, you have to make necessary preparations such as identifying the main issues included in the lesson and develop them by reading related reference materials mentioned at the last part of this teachers guide and the different web sites used in the text book. You are also required to plan how to localize the issues through student centred activities and allocate the time accordingly.

4.4 Presentation of the Lesson

a) Introduction to the Lesson

To start the lesson, it is important to invite students to share their prior knowledge by asking them the following questions:

- Why was the growth of world population very slow in the early periods?
- Explain the relations between population growth rate and doubling time.
- What is *population explosion*?

At this stage, students may have limited knowledge about the issues at hand but such brainstorming activity can trigger the attention of students towards the main points of discussion.

b) Body of the Lesson

Now give the students a chance to critically observe table 3.1 and figure 3.1 for a while and to ask them the following questions:

- What did you understand from table 3.1 and figure 3.1?
- Why has the doubling time become shorter and shorter since 1700 A.D?
- What factors contributed to the growth of world population from the 17^{th} century onwards?

Let them discuss in pairs or in small groups and forward their views. This will give them a chance to share their knowledge about the trend and growth of world population.

After extensive discussions, draw the attention of students to the following main points:

- Since 5000 B.C. the growth of world population was not steady but was marked by great fluctuations dictated by climate, food supply, diseases and war.

- From the 17th century onwards, due to advancements in science and technology (especially after the industrial revolution), world population started to grow rapidly.
- Because of declining costs of medicines, high-yield varieties of seeds, improvement of transport facilities, great decline of deaths (with associated increases in life expectancy) the world population grew, to reach 3.04 billion by 1960.
- It was estimated that world population reached 6 billion with an annual growth rate of 1.5% by 2000 A.D. Such rapid growth of population is termed as *population explosion*.

With the help of figure 3.3, let the students identify the three most populous countries of each continent and also let them compare the population shares of developed and developing countries, using table 3.3. Finally, you may summarize the main points of the lesson based on student's analysis.

c) Stabilization

Summarize the main ideas and concepts of the lesson.

- In the past global population was very slow but through time, especially after1950's due to large improvements in medication, transportation and agriculture, the world population accelerated. Such rapid growth is called population explosions.
- Doubling time is length of time needed by a population to double itself.
- Developing countries have short doubling time in comparison to developed countries. This make the trends of population growth rate very fast to the former (especially for Africa) than the later, which still shows a declining trends.

4.5 Evaluation and Follow up

a) Evaluation

You have to evaluate the whole performance of students (in discussions, answering questions and etc) throughout the period as a part of continuous assessments.

b) Follow up

- Form groups of five or more students. Let them discuss the activities and have a chance to present their main points to the class.
- Motivate students to perform independent activities such as to analyse and interpreting figure 3.2 and table 3.3 and grading them accordingly.

Additional Activities

1. What is the relationship between population growth rate and doubling time?
2. Describe briefly how the improvements of transportation techniques contributed to the increment of world population?

4.6 Answer key for Activities

Activity 3.1

According to table 3.1 and figure 3.1, up to 17th century world population had shown a slow increment with longer doubling time. However, from 17th century on ward, due to the advancement of science and technology, growth rate had been accelerated and reached a turning point. Especially after 1850's,the industrial revolution had contributed a lot to moderate medicine costs, modernizing agriculture (resulted in high-yield varieties of seeds) improvements of transport facilities greatly simplified the mobilization of resources across the world, etc. The combining effects of all these and other factors had been contributed to the declines of death rates and increased life expectancy. With such alarming growth rate, the doubling time of world population became lower until the coming 2020.

Activity 3.2

1. Africa and Europe
2. Africa experienced the shortest doubling time due to the highest growth rate of its population.
3. Environmental degradations, resource depletions, housing problems, accelerated soil erosion, etc.

   The corrective measures may include:
   - Applications of family planning
   - Awareness creation (education)
   - Empowering of women
   - Wise use of resources, etc.
4. Because of moderate medicine costs, high-yield varieties of seeds, improvements in transports facilities, great declines in death rates and the like made the population to grow in an alarming rate.

Activity 3.3

1. They have contrasting population growth rates. The developed countries have shown low growth rate with declining trends but the developing countries have shown an opposite rate and trends. For instance, Africa still has shown an increasing trend.

2. Asia (China, India and Indonesia), Europe (Germany, UK and Italy), North America (USA, Mexico and Canada), Latin America (Brazil, Argentina and Colombia), Africa (Nigeria, Egypt and Ethiopia).

Answer key for Additional Activities

1. They have an inverse relationship. This means, high population growth rate make the population to double itself within a short periods of time but the population with low growth rate have longer doubling time.
2. Improvement in transportation techniques, have a great role in mobilization of resources, industrial and agricultural products. Especially medicines and food items have a direct influence on the increment of world population.

3.2 COMPONENTS OF POPULATION CHANGE

Periods Allotted: 3

1. Competencies

By the end of this lesson, students will be able to:

- *describe components of population change;*
- *compute natural increase rate of population.*

2. Contents

- **Fertility, Mortality and Migration.**

3. Overview

The change of population is a dynamic process. The numbers of births, deaths, immigrants, and emigrants over specified time intervals determine the change in population size, and they are collectively known as *dynamics*, or *determinants*, or *components of population change*. Both fertility (birth) and mortality (death) are biological factors, while migration is purely non–biological in nature. For comparative purposes, these components of change are expressed as proportions of the total population, to yield the birth rate, death rate, migration rates, and the population growth rate. These rates are affected by different factors such as age, education, socio–cultural factors, etc.

4. Teaching-learning Process

4.1 Suggested Teaching Aids

Use the following teaching aids from the text book and add more from different web sites mentioned in it.

- Figure that shows components of population change
- Diagrams and demographic tables

4.2 Suggested Teaching Methods

Use the following teaching methods (in addition to those you want to apply);

- Brainstorming
- Field visit
- Group discussion
- Explanation

4.3 Pre Lesson Preparation

Read the contents on components of population change from the students text book as well as from other possible sources. And make the necessary preparation as used in the previous lesson with an improved approach.

4.4 Presentation of the Lesson

a) Introduction to the lesson

Ask the students the following questions just to begin the lesson:

- What was the total population of your locality in 1984, 1994 and 2007?
- What were the main causes of population change in the above-mentioned years?

This could be done as a starting activity for the whole class. After awhile, the students are required to compare their answers with the points mentioned in figure 3.4. This enables students to identify the three components of population change.

b) Body of the lesson

Draw figure 3.4 on the black board and let the students identify the implications of the plus and minus signs in the figure. After their attempt, you have to elaborate the figure. The minus (-) sign indicates reduction of population size because of death, emigration (out-migration) or both. Hence, on the other hand the two positive factors through which population increases are birth and immigration. But deaths and emigration are negative factors which counteract the positive factors.

After familiarizing the students with figure 3.4, let them discuss in groups the three dynamics of population change, based on the following leading questions:

- What are the meanings of *fertility, mortality* and *migration*?
- What are the factors that affect the three components of population change?
- How should fertility, mortality and migration of a human population be measured?

During the discussion, encourage the students to see the different issues in light of their localities. This would enable them to develop the skills of identifying area-specific problems and thereby to seek the solutions.

When you sum up the discussions, you may have to consider the following important points:

Fertility:

- It refers to the actual reproductive performance of a population, and it is the beginning of life
- It is not uniform throughout the world. It varies among continents, regions and countries. It is very much higher in developing countries than in developed ones.
- It is affected by factors like:

1. **Age at marriage**:
- early marriage results in more children because the girl will be exposed to sex for a long part of her reproductive years (15-49). But it is to the contrary in the case of late marriage.
- early marriage also has a negative effect on the health of both mothers and children. Because of the immaturity of the reproductive organs of the young mother, a lot of complication may occur.
2. **The status of women**
- It is a key determinant of fertility: To reduce fertility, women's status should be improved by giving them better opportunities for education, employment, decision-making, health and nutrition.
3. **Socio-cultural factors**: These include religion, ethnicity, and familystructure. These factors vary greatly across societies.
4. **Sex-preferences**: It increases the number of children until we get the desired sex.

Fertility can be measured using crude birth rate, general fertility rate and total fertility rate.

Mortality:

- It is the occurrence of death.
- It is higher in developing countries than developed countries, due to variations in the standard of living, nutrition, medical service, personal hygiene and environmental sanitation.
- It is measured by crude death rate and infant mortality rate.

Migration:

- It is the movement of people involved in making a permanent settlement in a new location.
- It can be measured using immigration rate, emigration rate and net migration rate.

Rate of natural increase and growth rate are very important for identifying changes in the total population of a particular nation or place.

c) Stabilization

Review the main ideas and concepts of the lesson

- Change in the size of a population is the result of the combining effects of changes in fertility, mortality and migration.
- Fertility is the actual reproductive performance of a population. It can be measured using CBR, GFR and TFR.
- The rate of fertility in developing countries is much larger than the developed countries.
- Mortality is the occurrence of death. Its impacts is measured by the use of CDR, IMR and expectation of life at birth.
- Infant mortality rate is a good indicator of the level of development of a country. IMR is high in developing countries (especially in Africa) due to malnutrition, various diseases and poor environmental sanitations.
- Life expectancy is the number of years a new born in a given region is expected to live. It tends to increase with standard of living.
- Migration is also determine the size of population of a given country and it can be measured using immigration rate, emigration rate and NMR.
- The overall change in the size of population can be calculated using RNI (BR - DR) and PGR (RNI $\pm$NMR).

4.5 Evaluation and Follow up

a) Evaluation

- Give them the different activities included under each component of population change.
- Provide them assignment to write short reports based on their localities.

b) Follow up

- Motivate students to discuss in group.
- Facilitate and coordinate the discussion.
- Help the students to perform field visit and report to the class.
- Record, rate and grade all the performance of the students.

Additional Activities

1. How rate of fertility can be reduced in the rural areas of Ethiopia?
2. Why international migration has very less impact on the total size of Ethiopian population?
3. Calculate:
   i. GFR, if the numbers of live births are 83,010 and women aged 15-49 years are 925,000.
   ii. PGR (population growth rate), if the rate of natural increase of place "Z" is 2.9% and the NMR is 20/1000.

4.6 Answer key for Activities

Activity 3.4

1. **Given:**
   Total life births (B) = 8400
   Midyear total population (P) = 240,000

$$CBR = \frac{B}{P} \times k = \frac{8400}{240,000} \times 1000 = \frac{35}{1000} = 35 \text{ births per 1000 per year}$$

2. $$CDR = \frac{170,300}{10,296,000} \times 1000 = \frac{16.5}{1000} = 16.5 \text{ deaths per 1000 per year}$$

3. Total midyear population = 100,000,000
   Women in their reproductive age = 0.25(50,000,000) = 12,500,000
   Total live births = 600,000

$$GFR = \frac{B}{P_1} \times k = \frac{600,000}{12,500,000} \times 1000 = \frac{48}{1000}$$

$$= \frac{48}{1000} = 48 \text{ births per 1000 reproductive women per year}$$

Activity 3.5

TFR for a given hypothetical kelil for year 2009 can be calculated based on the following information.

Age group	2009 births	2009 female population	ASBR (i.e. age specific birth rate) (live births per 1000 per ages)
15 – 19	15,000	95,000	157.9
20 – 24	25,000	213,000	117.3
25 – 29	30,000	232,000	129.3
30 – 34	24,000	221,000	108.6
35 – 39	12,000	215,000	55.8
40 – 44	3000	210,000	14.3
45 – 49	800	200,000	4.0
Total or $\sum$ of ASBR =			587.2

Each ASBR can be calculated using $\frac{B_x}{P_x} \times 1000$.

Example: $= \frac{15,000}{95,000} \times 1000 = 157.9$ live births per 1000 (ages 15 – 19)

$TFR = (\sum ASBR) \times 5$

= 587.2 × 5 = 2936 live births per 1000 female kelil residents in 2009 who live through their reproductive years.

Activity 3.6

1.

Developed countries	Developing countries
- Late marriage	- early marriage
- High status of women	- low status of a women
- Strong financial capacities	- the need to secure at old age

2.

- considerable political and financial support for family planning	- very low support and practices of family planning
- high access of medical services, education, etc.	- traditional belief attached with large size of children
- cultural norms tend to a firm the ideal of small family size	- low access of education, medical services, etc.
	- low empowerment of women, etc.

Activity 3.7

I

1. Yes. Because such information enable a woman to limit the number of children she would have in her reproductive ages.

2. Hints:

Latest information access, specifically about family planning, is a common problem throughout Ethiopia (just like other developing countries). But relatively, the problem is more series in the rural parts of the country. Some of the barriers may include:

- lack of adequate number of development agents (DAs) in the rural areas,
- remoteness of an area,
- lack of adequate number of health centers,
- less number of health professionals, etc.

The above barriers can be reduced by:

- strengthening the efforts of getting more DA (both in quality and quantity),
- improving the efforts shown in the areas of infrastructure development, etc.

II

1.

Developed countries:

- very low birth rates and death rates (this is because of high status of women);
- population is dominated by productive age group (Adults) and hence dependency ratio is very low;
- very high life expectancy rate, etc.

Example: Germany, USA, France, etc.

Developing countries:

- high birth rate and death rates (due to low status of women);
- dominated by young population and this created high dependency ratio;
- low life expectancy rate, etc.

Example: Ethiopia, Sudan, Zambia, etc.

2. High birth rates (fertility) contributes to over population in many developing countries, which in turn creates a situation of having large number of people with too few resources and too little spaces, are closely associated with poverty. This can result from high population density or from low amount of resources, or from both.

Activity 3.8

1. Africa still has shown the largest fertility rate in the world. This is because of:
   - In Africa tradition demands high rates of reproduction. Here the opinion of women in the reproductive years may have little influence weighed against intense cultural expectations;
   - Very low applications of contraceptive methods;
   - Low education and economic statusof women greatly erodes their decision powers towards the size of children they would have;
   - Children are also considered as assets, etc.

2.

i. Region A

$$CBR = \frac{4500}{160,000} \times 1000$$
$$= 28/1000$$

ii. Region B

$$CBR = \frac{20,500}{2,500,000} \times 1000 = \frac{8.2}{1000}$$

3. i. Region F

$$GFR = \frac{73,060}{826,000} \times 1000$$
$$= 88.5/1000$$

ii. Region G

$$GFR = \frac{50,000}{950,000} \times 1000 = \frac{52.6}{1000}$$

Activity 3.9

1.

i.

Country A	**Country B**
$CDR = \frac{9000}{200,000} \times 1000$	$CDR = \frac{8000}{480,000} \times 1000$
$= 45/1000$	$= 16.7/1000$
$IMR = \frac{4200}{25,000} \times 1000$	$IMR = \frac{2000}{28,000} \times 1000$
$= 168/1000$	$= 71.4/1000$

ii. Country B has better standard of living. Because its IMR is lower than the IMR of country A.

Activity 3.10

1. RNI = BR – DR

$$= \frac{47}{1000} - \frac{18}{1000} = \frac{29}{1000}$$

2. Population growth rate (PGR) for place A

PGR = BR – DR ± NMR

= RNI ± NMR

$$= 3.1\% \pm 20/1000 = \frac{31}{1000} \pm \frac{20}{1000} = \frac{51}{1000} \text{ or } \frac{11}{1000}$$

3. Population in

1994 = 53 mill = P_0

2007 = 73 mill = P_1

1994 – 2007 = 7 yrs = t

Population annual Growth Rate

$$= \sqrt[7]{0.38} \times 100 = \left[\sqrt[t]{\frac{P_1}{P_0}} - 1 \right] \times 100 = \left[\sqrt[7]{\frac{73}{53}} - 1 \right] \times 100$$

$$= \left[\sqrt[7]{1.38} - 1 \right] \times 100 = \left[\sqrt[7]{0.38} \right] \times 100$$

GR = 0.00114 × 100 = 0.11

Answer key for Additional Activities

1.

- through empowering of women
- by ensuring affirmative actions
- by expanding sustainable extension services through development agents, etc.

2. Because in Ethiopia, there is no strong economy that acts as a pulling factors for external or international migration. Emigration also very insignificant and doesn't bring a substantial change in the total size of the country's population.

3. i. $GFR = \frac{83,010}{925,000} \times 1000 = \frac{89.7}{1000}$

ii. PGR = 2.9% ± 20/1000

$$= \frac{29}{1000} \pm \frac{20}{1000}$$

$$= \frac{49}{1000} \text{ or } \frac{9}{1000}$$

3.3 POPULATION STRUCTURE

Periods Allotted: 2

1. Competencies

Up on completion of this subunit, students will be able to:

- *interpret population pyramids of developed and developing countries.*

2. Content

- **Population structure**

3. Overview

The structure of population is the make-up of the age and sex composition of a given population. It is shown by a graph called *population pyramid*.

The population pyramid is useful to show the proportion of different age-groups which are dependent (i.e., the old and young ones) and economically active adult age group.

Its shape is varies between developing and developed countries.

4. Teaching-learning Processes

4.1 Suggested Teaching Aids

Use the different diagrams of population pyramids from the textbook.

4.2 Suggested Teaching Methods

You are required to implement the following teaching methods;

- Brainstorming
- Discussion
- Independent tasks

4.3 Pre Lesson Preparation

In advance, read more about the various types of population pyramids and associated demographic implications. And get ready with figures of population pyramids that show the population structures of some sample countries including developing and developed ones.

4.4 Presentation of the Lesson

a) Introduction to the lesson

Motivate the students to review what they learnt previously and then ask the following questions as a brainstorming activity to introduce the new lesson:

- What are the three age groups of a population?
- Which age group is the dominant one in your locality? Why?
- What is a population pyramid? And what is its use?

b) Body of the lesson

Let the students see figure 3.8 and ask them how to interpret the population pyramids of Ethiopia and Canada based on the following questions:

- Into how many age intervals is the population divided?
- In economic terms, how many age groups did you observe? Describe their names as age groups.

After developing the skills of interpreting population pyramids, let the students do exercise 3.4 which enables them to compare and contrast the population pyramids of Ethiopia and Canada as developing and developed countries respectively. And give a chance to two or three students to present their findings to the class for further discussions.

During the discussion time, draw the attention of the students to the following important points:

- The population structure shows the number of males and females within three (young, adult and old) age groups in the population shown by a graph called age-sex or population pyramid.
- A population pyramid is useful for calculating the sex and average-dependency ratios of a population. It is wider at the bottom for developing countries, but at the top for developed countries.

c) Stabilization

Summarize the main ideas and concepts of the lesson.

- Population structure is the distribution of males and females within different age groups.
- A population pyramid shows the distribution of various age groups to different sex in a human population.

- The population of a given country can be grouped into young dependents (0–14), elderly dependents (+65) and the working age group that are economically active (15–65 years of age). These categories enable to know the average dependency ratio of any country.
- The population pyramid of developing countries is wider at the base and narrow ate the apex. But that of the developed countries, it is narrow at the base and relatively wider at the middle with subsequent decline towards the apex.
- Sex ratio is the number of males per females (or vice versa). It is expressed in percentage or ratio form.
- Age-sex structures of the population of different countries are varying depending upon variation in the socio-economic settings and demographic history of the individual country.

4.5 Evaluation and Follow up

a) Evaluation

- Ask the students to interpret different kinds of population pyramids of different countries from different sources.

b) Follow up

- Motivate the students to search for population pyramids of different countries from different sources.
- Encourage students to discuss in groups, the population structures of some sample countries from developed and developing regions.
- Grade all their activities and record them on the mark list.

c) Additional Activities

1. Describe briefly the main advantages of population pyramids.
2. How can minimize the high average dependency ratio of developing countries like Ethiopia?

4.6 Answer key for Activities

Activity 3.11

a.

Country		
X	**Y**	**Z**
$SR = \frac{300,000}{500,000} \times 100$ $= 60\%$ $ADR = \frac{50\%(800,000)}{50\%(800,000)} \times 100$ $= \frac{400,000}{400,000} \times 100$ $= 100\%$	$SR = \frac{460,000}{1,250,000} \times 100$ $= 36.8\%$ $ADR = \frac{35\%(1,250,000)}{65\%(1,250,000)} \times 100$ $= \frac{437,500}{812,500} \times 100$ $= 53.8\%$	$SR = \frac{460,000}{930,000} \times 100$ $= 50\%$ $ADR = \frac{56\%(930,000)}{44\%(930,000)} \times 100$ $= \frac{520,800}{409,200} \times 100$ $= 127.3\%$

b. In relative terms country "Y" has better socio-economic development. Because it has the lowest ADR among other countries.

c. Country "Z". It can be reduced through slowing down the rate of fertility by improving the economic status of women, by providing adequate financial support to improve family planning practices at household levels.

Activity 3.12

1. Ages with intervals of 5 years.
2. Cone shaped or true pyramids.
3. It shows a low and declining birth rate and a low death rate.
4. Young dominated population on such pyramid, each age group is larger than the one above it. The birth rate is high compared with the death rate.
5. Constrictive population pyramid
6. True pyramid and constrictive pyramid
7. The population pyramid that represent developing countries (i.e. Fig. 3.6a).
8.
   i. dependents:
      Young (0 – 14 years of age)
      Elderly (65^+ years of age)
   ii. Economically independent (15 – 65 year of age)
9. The population pyramid that represent developed countries (i.e. 3.6 b)

10.

Population characteristics	Ethiopia	Canada
Broad based and narrowing pyramid at the top	✓	
It has the highest birth rate.	✓	
It has fastest natural increase of population.	✓	
Highest infant mortality rate	✓	
Highest % living to middle age		✓
Lowest life expectancy.	✓	
Many people survive beyond the age of 65.		✓
Highest dependant age group	✓	

11. As you indicated your choice in the table, the population of Ethiopia is represented by the population pyramid which is broad at the base and very narrow at the top. Such kind of population structure revealed the prevalence of high birth rates with subsequent natural increase of population. Above all, the domination of young population, which is the dependent age group, adversely affect the economy and there by resulted in high infant mortality rate and very low life expectancy. But in the case of Canada, the population is dominated by middle age group (Adults), which is productive and this enable most of the country's population to live beyond the age of 65.
12. The population pyramid became more similar to that of the developed countries. That is, broad at the middle (in most cases) with subsequent decreases towards the top. The base also relatively narrow.

Answer key for Additional Activities

1. Population pyramid is very useful to:
   - Identify the proportion of the three age groups of a population based onsex.
   - Know the magnitude of dependency ratio
   - Compare the population structures of developed and developing countries.
   - Predict both short and long-term population change, etc.
2. The current high percentage of dependency ratios of developing counties (like Ethiopia) can be reduced:
   - by empowering women
   - through the application of contraceptive methods
   - by improving both access and quality of education, medical services, etc.
   - by expanding infrastructure and creating more jobs
   - by creating conducive environment to attract more private investors, etc.

3.4 SPATIAL DISTRIBUTION OF WORLD POPULATION AND POPULATION DENSITY

Periods Allotted: 4

1. Competencies

Up on completion of this subunit, the students will be able to:

- *discuss the factors affecting the spatial distribution of world population;*
- *compute crude and agricultural population densities;*
- *realize cause and types of human migration;*
- *compare levels of urbanization at the continental level;*
- *state factors affecting the urbanization process.*

2. Contents

- **Factors affecting Spatial Distribution of world population**
- **Population Density**
- **Human Migration**
- **Urbanization**

3. Overview

Due to positive and negative factors, human populations are not equally distributed throughout the world. Such uneven distributions of population can be measured by using crude and agricultural densities.

Human migrations (both internal and external) are induced by *push* and *pull* factors which create the re-distribution of population in different areas.

Urbanization is a process of creating permanent settlement in small areas like cities. The population size that defines an urban center varies from country to country. It is affected by rate of natural increase, migration and industrialization.

4. Teaching-learning Process

4.1 Suggested Teaching Aids

Use the following as a main teaching aid material:

- World map that shows population distribution of the world.
- Map that shows major urban centers of the world.

4.2 Suggested Teaching Methods

The following are the main teaching methods to be employed;

- Explanation

- Discussion
- Independent tasks

4.3 Pre lesson Preparation

Make a necessary preparation ahead of time in the areas of world population distribution and urbanization by referring to relevant materials with suitable teaching aids.

4.4 Presentation of the Lesson

a) Introduction to the lesson

List out the main discussion points on the black board and then ask the students how they are related to the previous lesson they learned. After awhile, continue to ask the following questions:

- Why is the world population distributed unevenly?
- What are the factors that affect population distribution of the world?
- What are the main causes of migration?
- What is urbanization?

Encourage the students to see and relate the above issues with their own environment.

b) Body of the lesson

Let the students refer to figure 3.9 and seek to answer the following questions:

- Which regions or areas of the world are densely or sparsely populated? Why?
- How do you measure such unequal distribution of world population?

After discussing the global population distribution, motivate the students to identify concepts and roles of migration and urbanization in reshaping the distribution of human population, based on the following questions:

- What are the push and pull factors of migration?
- How do they affect the densities of population at the areas of origin and at destination?
- What factors affect the process of urbanization?
- How do migration and urbanization affect the environment?

During the discussions, consider the following points:

- Population distributions of the world are unequal due to negative and positive factors.
- The most densely populated regions of the world are the Asiatic population belt and Europe. The sparsely populated areas include tundra, hot dry, hot wetlands, high relief and areas with poor soils.

- Crude and agricultural densities are the most common measures of population densities.
- Both the push (forcing out) and pull (attracting) factors affect internal as well as external migrations.
- Urbanization is the process by which large numbers of people permanently concentrate in relatively small areas, forming cities or towns. It is affected by rate of natural increase, migration and industrialization.

c) Stabilization

Review the main ideas and concepts of the lesson.

- Population distribution of the world is uneven due to physical (ecological), socio-economic, political and demographic factors.
- The density populated areas of the world include the Asiatic population belt, Europe and American cluster. Whereas, the Tundra, Tropical deserts as well as humid regions and very high mountain areas are sparsely populated ones.
- Population density shows the spread of population over space and it can be measured using crude and agricultural densities.
- Agricultural density gives a better indication of population pressure on resources especially in agrarian countries.
- Migration is a process of movements in which population are involving in permanent change of their original residential areas. It can take place in the form of internal or external (international) migrations, where both push and pull factors have played an important role.
- Urbanization is the processes of population concentration in areas of non agricultural activities. It is affected by high rate of natural increase, rural to urban migration, development of commerce, transpiration, communication, etc.

4.5Evaluation and Follow up

a) Evaluation

Ask students to identify:

- densely and sparsely populated areas of the world with associated factors.
- factors that affect urbanization processes.
- the impacts of urbanization upon their environment.

b) Follow-up

- Motivate the students to share their knowledge and experiences through group work and pair tasks.
- Grade and record every performance of the students.

Additional activities

1. Why the densely populated areas of the world are located along the major river basins.

2. Urbanization is a sign of development. Do you agree or disagree to this statement? Why?

4.6 Answer key for Activities

Activity 3.13

Factors	Explanation	Example	Encourages and discourages settlement
High amount of rainfall	Sufficient water for farming	- Most of Western Africa counties - Most of countries of temperate areas.	Encouraging
Plain	Suitable for agriculture	Some coastal parts of Mediterranean Europe	Encouraging
Steep mountains	Erosion is maximum	The North Central massifs of Ethiopia	Discouraging
Poor standard of living	Very low economic and education status	Sub-Sahara Africa countries	Discouraging
Political unrest	Affect the stability of nations	- Somalia - Afghanistan	Discouraging
Very hot and humid climate	Dense forest infested with diseases	Congo	Discouraging
Manufacturing industries	Create strong economic base	- Western European counties - USA, Japan - Russia, China, India	Encouraging

- According to Figure 3.7
  - Densely populated regions of the world include China, India, Japan, Korean Peninsula, Pakistan, Western Europe, North eastern part of USA, Nile valley of Egypt, Western Africa, etc.
  - Moderately populated regions of the world include the central part of USA, the coastal parts of S. America, Eastern Asia, etc.
  - Sparsely populated regions of the world include Greenland, Siberia, Sahara desert, Amazon and Congo forest areas, Himalaya, Tundra, etc.
- High concentration of population especially in rural areas, discouraged modern mechanized agriculture. This is because of fragmentation of farming lands. It increases environmental degradations (because of the subsequent effects of deforestations) and rural to urban migration also accentuated. However, the falling of population concentration could reverse the situations and may create a suitable condition for sustainable development.
- It is possible to achieve a balance between population growth and carrying capacity of the environment through the application of anti-natal population policy.
- Over-population – a situation when the available or existing resources of a country, region, etc are insufficient to provide the people with optimum standard of living. Example over populated areas includes China, India, Indonesia, etc.
- Under population – when there are less number of people in an area to make full use of the resources available (e.g. food production, energy and minerals) such as

Canada, where resources could support higher number of people without undermining their living standards.

Activity 3.14

1. Ethiopia's:

$$\text{Crude density} = \frac{\text{Total population}}{\text{Total area in km}^2} = \frac{79,000,000}{1,106,000\,\text{km}^2} = 71.4 \text{ persons per km}^2$$

2. China's

$$\text{Crude density} = \frac{1,264,536,000}{9,596,960\,\text{km}^2} = 131.8 \text{ persons per km}^2$$

Activity 3.15

Part I

1. Ethiopia's

$$\text{Agricultural density} = \frac{\text{Rural population}}{\text{Cultivated land area in km}^2} = \frac{61,900,000}{176,960\,\text{km}^2} = 349.8 \text{ per. km}^2$$

2. Since more than 80% of the Ethiopian population is found in the rural areas, agricultural density is a good indicator of the population- resource relationship than any other population distribution measures.
3. Some of the advantages of agricultural density include:
   - it shows the degree (extent) of the rural population pressure
   - it reveals a kind of signals for rural to urban migration
   - it indicates the actual and potential adverse effects of population upon the rural environment.
4. It includes area which is not covered by human population, as a result, it doesn't shows the real relationship between population distribution and the corresponding area.

Part II

1.

Country		
A	**B**	**C**
$\text{Crude density} = \frac{18,000,000}{95,000\,\text{km}^2}$ $= \frac{195.5\,\text{persons}}{\text{km}^2}$	$= \frac{22,000,000}{90,000,000\text{km}^2}$ $= \frac{244.4\,\text{persons}}{\text{km}^2}$	$= \frac{30,000,000}{150,000\text{km}^2}$ $= \frac{200\,\text{persons}}{\text{km}^2}$

$\text{Agricultural density} = \frac{75\%(18,000,000)}{30\%(95,000\text{km}^2)}$ $= \frac{13,500,000}{28,500\text{km}^2}$ $= \frac{473.7\,\text{persons}}{\text{km}^2}$	$= \frac{20\%(22,000,000)}{10\%(90,000\,\text{km}^2)}$ $= \frac{4,400,000}{9000\ \text{km}^2}$ $= \frac{488.9\,\text{persons}}{\text{km}^2}$	$= \frac{55\%(30,000,000)}{35\%(150,000\text{km}^2)}$ $= \frac{16,500,000}{52,500\text{km}^2}$ $= \frac{31.4\,\text{persons}}{\text{km}^2}$

2. For country "A" agricultural density is a better measurement than crude density. This is because, among the three countries, the largest percentage (75%) of the population of country "A" is found in the rural areas.

Activity 3.16

1. The question is local specific, so it is left to the students.
2. Refugee – person who has been forced to leave his country, home, etc. and seek refuge, especially from political or religious persecution.
   - Evacuee – migration of forced movement of people caused by natural calamities like earth quake, volcanic eruption, flooding, drought, etc.
3. Resettlement migration

Activity 3.17

1.

Ecological factors	Economic factors	Socio-cultural factors	Political factors
- Harsh or favourable climate - Natural disaster	- Poor or good employment opportunity - Housing shortage or improvements - Low or high wages	- Planning decisions - Good welfare services - High living standard	- Political un-stability or stability

2. The question is area specific, so it is left to the students.
3. Effects of migration at the:
   i. Origin
      - Loss of man power (e.g. Brain drain or educated people)
      - Foreign income in the form of remittance, etc.
   ii. Destination
      - Gaining of trained man power
      - Cheap labour power
      - High population concentration (especially in the USA), etc.
      -

Activity 3.18

1. When we compared the level of urbanization at the continental level, N. America, Latin America and Europe are stand first, second and third respectively. This is because of their economies are mainly dependent on manufacturing industries and service industries (especially in N. America and Europe). Currently some of the large Latin American countries have shown a great economic progress such as Brazil. Asia and Africa are still at low level of urbanization and they stand fourth and fifth accordingly. However, some populous countries of Asia (like China and India) are currently registered the highest economic growth in the world, but very large proportion of their population live in the rural areas. In Africa, urbanization is still at lowest level. This is because agriculture is the dominant economy of the continent and more than two third of its population live in the rural areas. In short, N. America and Africa are the most and the least urbanized continents respectively (See Table 3.9).
2. Because very large percentage of the population of the developed countries are involved in the manufacturing industries and in the service sectors.
3. Because of high rates of rural to urban migration and relatively higher rate of natural increase.
4. The urban population of the developed countries have earned their living from manufacturing industries and service factors (like trade, transport, communication and tourism).

Activity 3.19

1. Some of the factors that contributed to the growth of urbanization in Ethiopia include:
   - the establishment of central government
   - the expansion of modern means of transport and communication, schools, hospitals and modern business.
   - Ethiopia's contact with the outside world
   - The establishment of large number of industries and mechanized farms, etc.
2. According to the UN population division (2003), the ten largest cities of the world include; Tokyo, Japan (35 mill.), Mexico city, Mexico (18.7 mill.), New York, Unites States (18.3 mill.) Saopaulo, Brazil (17.9 mill.) Mumbia, India (17.4 mill.) Delhi, India (14.1 mill.), Kolkata (calcutta), India (13.1 mill.), Buenos Aires, Argentina (13 mill.), Shanghai, China (12.8 mill.) and Jakarta, Indonesia (12.3 mill.).
3. The five largest urban centres (cities/towns) in Ethiopia are Addis Abeba, Dire Dawa, Nezerate, Mekele and Gondar.
4. Some of the problems related to rapid urbanization in developing countries like in Ethiopia are include:
   - Unemployment
   - Series housing shortage

- Sanitation problems
- Lack of adequate social services
- Environmental degradation, etc.

The above mentioned problems could be solved by:

- Slowing down high population growth rate through family planning practices,
- Implementing sustainable environment conservation measures by integrating indigenous knowledge and practices with modern sciences.

Answer key for Additional Activities

1. The major river basins of the world are areas of dense population. This is because, most river basins have:
   - hospitable climate for settlement
   - fertile alluvial soils
   - more access to water resources
   - good sites for some manufacturing plants, etc.
2. Urbanization with a strong economic base is definitely a sign of development (like the western world). However, in developing countries (like in Ethiopia), urbanization and development don't have strong interconnections. This is because, natural increases and rural to urban migration together are fuelled the rate of urbanization and this adversely affect the agricultural sector that is considered as the economic backbone of most developing countries.

3.5 POPULATION OF ETHIOPIA

Periods Allotted: 4

1. Competencies

By the end of this section, students will be able to:

- *compare the present population size of Ethiopia with the past;*
- *describe the spatial distribution of Ethiopia's population;*
- *show the demographic characteristics of Ethiopia's population;*
- *analyze the population structure of Ethiopia;*
- *realize population policy of Ethiopia.*

2. Contents

- **Population size, distribution and growth rate**
- **Components of population change in Ethiopia**
- **Population structure of Ethiopia**
- **Population policy of Ethiopia**

3. Overview

Recently, as in other developing countries, Ethiopia's population has shown a fast growth rate. It is distributed unevenly throughout the country.

Among the components of population change, fertility and mortality have more influence than migration.

Ethiopia's population is predominantly young due to the effects of a high fertility rate. To moderate this situation, the country has adopted an anti–natal population policy since 1993.

4. Teaching-learning Processes

4.1 Suggested Teaching Aids

Use the following teaching aids from your library and student text books.

- Population maps of Ethiopia
- Atlas of Ethiopia
- CSAs population data (1984, 1994 and 2007)

4.2 Suggested Teaching Methods

These are the main teaching methods forwarded for this lesson:

- Brainstorming
- Group discussion
- Explanation
- Independent tasks

4.3 Pre Lesson Preparation

You are advised to be prepared ahead of time for this particular lesson, in which you have to:

- refer to population-data reports of the Central Statistic Agency (CSA)
- get ready with population map of Ethiopia
- read additional materials relevant to the issues of the lesson

4.4 Presentation of the Lesson

a) Introduction to the lesson

Start the lesson by giving the students a chance to review what they have learnt in past lessons. And then ask the following questions:

- How many nations and nationalities are found in Ethiopia?
- Why has the population of Ethiopia shown a fast growth rate?
- What are the impacts of high population growth rate in your locality?

b) Body of the lesson

After the brainstorming activity, facilitate group discussions, using the following approach.

Let the students:

- analyse the trends of population growth of the country, using table 3.13 and figure 3.11.
- identify the sparsely and densely populated areas. And let them reason out the possible causes for such variation in population distribution.
- analyse the trends of the dynamics of population change (especially fertility and mortality) at regional bases with associated economic and environmental implications.
- identify the population structure by interpreting the population pyramids of Ethiopia, using figure 3.8 (a).

Later on, you are required to highlight the population policy of Ethiopia to the students by relating it to the main demographic features of the country.

During the discussion, draw the attention of the students to the following points:

- Ethiopia's population has shown fast growth rates, with very slight reductions.
- Among the components of population change, fertility and mortality strongly affect the population structure of the country. They vary from region to region, and they are also higher in rural areas than in urban centers.
- The main causes of high mortality are poverty and low standards of living. Recurrent drought and famine also worsen the situation.
- Migration has very low influence upon the country's population, due to low mobility of the people.
- The country's population is predominantly young and showsahigh dependency ratio, which adversely affect the development of different sectors at large.
- Since 1993, Ethiopia has adopted an anti-natal population policy to moderate its high population growth rate.

c) Stabilization

Summarize the main ideas and concepts of the lesson.

- Even if the Ethiopian population growth rate currently has shown a declining trend, it is projected to grow by 2.6% (1.9 mill.) per year. This rapid growth seriously strains socio-economic development of the country.
- In Ethiopia dense population is observed in the highland areas where the climate is favourable for agricultural production but in the peripheral lowland population is very sparse due to the presence of harsh climate.

- The TFR in Ethiopia is one of the highest in the world. It varies from region to region and between urban and rural areas across the country.
- Currently the mortality rates (CDR and IMR) have decreased in Ethiopia due to improved medical technology and access to health services. However, there is a fear that this decreasing trend will be reversal by the impact of HIV/AIDS.
- The population of Ethiopia is dominated by young, which is adversely affecting the socio-economic development of the country.
- Ethiopia adopted anti-natal population policy in 1993, in order to reduce the rapid growth rate of its population and thereby to attain the desired objectives.

4.5 Evaluation and Follow up

a) Evaluation

Ask students in different forms (such as in class work, quiz, assignment) to identify:

- the variation of population distribution with associated causes in Ethiopia
- the demographic characteristics of the country's population
- the impacts of population growth in their local environments.

b) Follow up

- Motivate the students to participate actively in group discussions, independent task and the likes.
- Grade and record every performance of the students.

Additional Activities

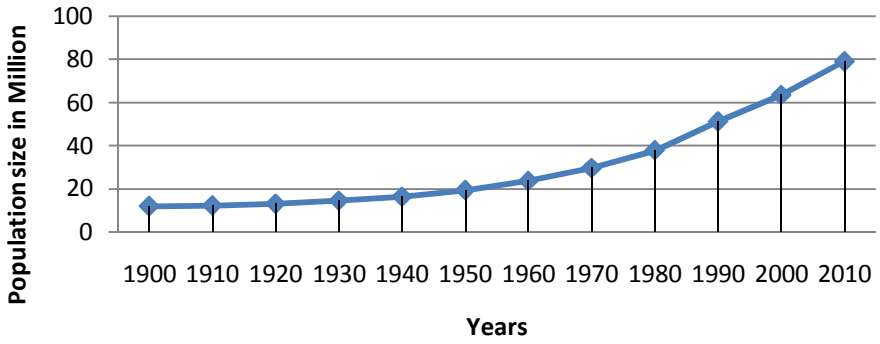
1. Why very large population are concentrated in the highlands of Ethiopia?
2. What measures to be taken to alleviate the problems created by high population pressure upon the environments of the highland areas?

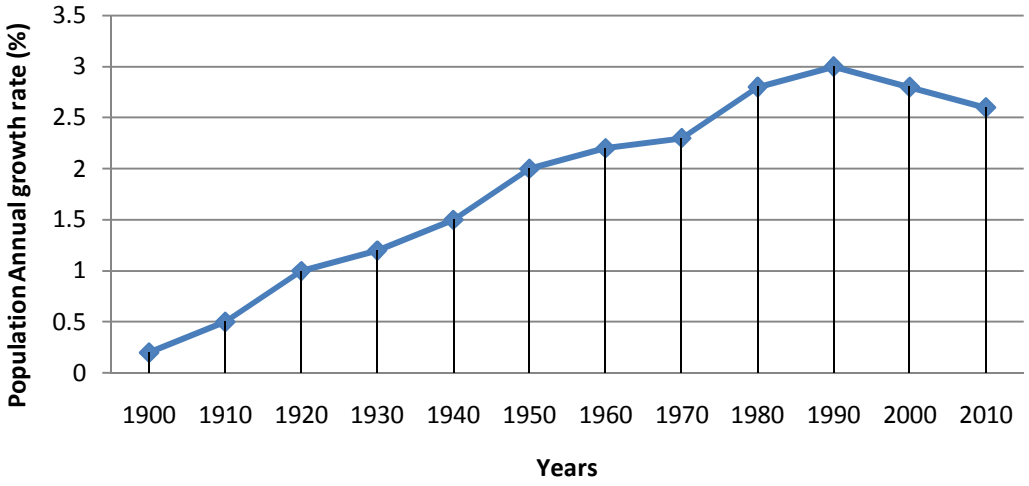
4.6 Answer key for Activities

Activity 3.20

1. By 1900 the Ethiopian population was about 12 million with 0.21 and 346 years growth rate and doubling time respectively. But after 1920 it started growing very fast with 60 years doubling time and reached 23.5 million by 1960 with 32 years doubling time. Such trend were continuing and have shown the population of 53.4 million (by 1993) and 61.6 million (by 1999)with shortest doubling time, 23 and 24 years respectively. However the annual growth rate reduced from 3.1% to 2.9%. By 2010, the country's population was estimating to registered 79 million with 2.6% growth rate and 27 years doubling time.

2.





As you can see from the above two graphs, the increment of population size and growth rate was very slow up to 1920. But the doubling time was starting to reduce drastically. Since 1950's on ward, the population size have shown alarming increment with the corresponding growth rate change that reached maximum reduction. After 1990, population still have shown an increment trend but in a slow growth rate with relatively longer doubling time.

3. Yes. Ten years. The slopes of growth rates and doubling time were fluctuating with the corresponding increment of population size between 1900 to 2010.

4. Generally, such continuing increment of the Ethiopian population alarming degraded the environment and resulted in the destruction of natural resources, shortage of food, and adversely affect investment and saving opportunities that hindered the development of social services.

5. To alleviate the adverse effects of high population growth upon the environments of the country, all the concerned bodies (such as individuals, communities,

government, etc) have to contribute their best efforts in order to materialized effective applications of family planning (especially in the rural areas), awareness creation, empowerment of women, etc.

6. Hint:

   - As an educated individual you could reduce population growth through practicing late marriage in your reproductive life time. Such kind of commitment may contribute a lot to the solutions of high population growth related problems.

Activity 3.21

3. Use the information from table 3.13 and show their locations using figure 3.12.
4. Favourable climate, rich soil, relief and agriculture.
5. Since altitude is the strongest factor that greatly influences the distribution of rainfall, vegetation and soil in Ethiopia, population distribution also dictated by the variation of altitude with the corresponding variation of such resources.
6. The total population of Ethiopia who live in the lowland areas (below 1500m above means sea level) in percentage can be obtained in the following ways;

Altitude in meter	**% of total population**
100 – 1400	8.5
< 1000	2.8

Total = 11.3% of the population live below 1500 meter in Ethiopia

7. The altitudinal ranges from 1800 m – 2600 m is an area that supports67.1% of the total population of Ethiopia. This is because; it is endowed with hospitable climate (sufficient rainfall and moderate temperature), best agricultural areas, rich soil, etc.
8. High population density has created adverse impacts on the highland's environment in Ethiopia. To mention some of them:
   - Environmental degradation (because of deforestation, over grazing, traditional farming systems etc.)
   - Soil depletion
   - Food shortage
   - Drought
   - Famine (in most cases), etc.

9. To mitigate the impacts of population pressure from the highland areas of Ethiopia, measures should be taken to resettle the people in the vast and drained lowland areas of the country through the coordination efforts of the government. This can be materialized by:
   - Motivating the people through incentives (like construction of small dams by the government to facilitate irrigation practices)
   - Developing infrastructures (roads, hospital, schools, etc)
   - Providing loan access to the volunteer settlers, etc.

Activity 3.22

1. Highest CBR in rural (Harari) and in urban (SNNPR). This is because inadequate applications of family planning practices and other related problems.
2. Because of early marriage, socio-cultural factors, poor family planning practices. This situation can be improved by: education, empowering rural women and by providing financial sources (e.g. through micro finance institutions).
3. Because, relatively in urban areas there are better accesses of education, employment, family planning services, etc.
4. Because of very low access to contraceptive method, socio-cultural barriers and inadequate efforts of empowering women (especially in the rural areas).

Activity 3.23

1.
   i. Both CDR and IMR are decreasing but life expectancy at birth is increasing. This is because due to the general improvements of the country's economy that enabled to upgrade the social facilities both in quantity and quality.
   ii. Because of low access to medication, lack of adequate nutrition, inadequate family planning practices, etc.
2. Yes. Because the country's economy is greatly dependent on agriculture, which is highly influenced by the environment. Currently the environment across the different areas of the country is degraded from time to time and resulted in low agricultural production where by poverty has prevailed consequently.
3. Especially in creating of awareness in the school and in the nearby communities both teachers and students could play great roles.

Activity 3.24

1. Multiply the total population of each year by the percentage given for the three age groups accordingly, then you will get the following, which is used to answer the subsequent questions.

Year	Young	Adult	Old
1984	19,769,100	19,358,100	1,972,800
1994	24,243,600	27,447,600	1,708,800
2007	33,255,000	38,280,200	2,364,800
2010	37,400,000	45,050,000	2,550,000

i. $\text{ADR} = \frac{\text{young} + \text{old}}{\text{Adult}} \times 100$

1984	1994	2007	2010
$= \frac{21,741,900}{19,358,100} \times 100$ $= 112.3\%$	$= \frac{25,952,400}{27,447,600} \times 100$ $= 94.6\%$	$= \frac{35,619,800}{38,280,200} \times 100$ $= 93.1\%$	$= \frac{39,950,000}{45,050,000} \times 100$ $= 88.7\%$

ii. $\text{Young age dependency} = \frac{\text{young}}{\text{Adult}} \times 100$

$\frac{19,769,100}{19,358,100} \times 100$ $= 102.1\%$	$\frac{24,243,600}{27,447,600} \times 100$ $= 88.3\%$	$\frac{33,255,000}{38,280,200} \times 100$	$\frac{37,400,000}{45,050,000} \times 100$ $= 83\%$

iii. $\text{Old age dependency} = \frac{\text{Old}}{\text{Adult}} \times 100$

$\frac{1,972,800}{19,358,100} \times 100$ $= 10.2\%$	$\frac{1,708,800}{27,447,600} \times 100$ $= 6.2\%$	$\frac{2,364,800}{38,280,200} \times 100$ $= 6.2\%$	$\frac{2,550,000}{45,050,000} \times 100 =$ 5.7%

2. ADR can be reduced in Ethiopia by:
   - Empowering of women
   - Improving the agricultural sectors
   - Expanding extension services in the rural areas

- Expanding agro-industries
- Improving the quality of education, health services, etc.

4.

Region	$SR = \frac{male}{female} \times 100$
Tigray	$= \frac{2,124,853}{2,189,603} \times 100 = 97\%$
Afar	$= \frac{786,338}{624,754} \times 100 = 125.9\%$
Amhara	$= \frac{8,636,875}{8,577,181} \times 100 = 100.7\%$
Oromiya	$= \frac{13,676,159}{13,482,312} \times 100 = 101.4\%$
Somali	$= \frac{2,468,784}{1,970,363} \times 100 = 125.3\%$
Benshangul-Gumuz	$= \frac{340,378}{330,469} \times 100 = 103\%$
SNNP	$= \frac{7,482,051}{7,560,480} \times 100 = 99\%$
Gambella	$= \frac{159,679}{147,237} \times 100 = 108.5\%$
Harari	$= \frac{92,258}{91,086} \times 100 = 101.3\%$
Addis Ababa	$= \frac{1,304,518}{1,433,730} \times 100 = 91\%$
Dire Dawa	$= \frac{171,930}{170,897} \times 100 = 100.6\%$

From the above calculations, you can easily identify regions with:

Highest SR

- Afar region
  = 125.3% (125.3 males per 100 females)
  Because of traditionally females are more exposed to hardships and related deaths.

Lowest SR

- Addis Ababa
  = 91% (i.e., 91 males per 100 females)
  Because of high migration of females from the nearby rural areas.

Activity 3.25

1. Anti-natalist. Because it discourages high rates of population growth.
2. If anti-natalist population policies are effectively implemented in your area, most of the problems that are associated with over population could be solved through time and thereby possible to maintain the quality (well being) of the environment.
3. The traditional institutions like "Edir", "Equb", "Mahaber" and the like are very useful institutions where you could meet the local people and implement awareness creation. However, there are some barriers that hindered the cooperation of these local institutions such as lack of incentives, inadequate strategies approach, lack of sustainable cooperation, etc.

Answer key for Additional Activities

1. The highland parts of Ethiopia support very large population. This is because of relatively the presence of suitable climate, fertile soil, better infrastructure (in urban areas), etc.
2. The environmental problems already created by high population pressures in the highlands of Ethiopia can be mitigated by:

- Applying volunteer resettlement programmes in the peripheral lowlands of the country. This is because, in the lowlands, there are huge agricultural potential areas suitable for irrigation.
- Integrating and effectively utilizing indigenous knowledge and practices with modern scientific methods, etc.

Answer Key for Unit 3 Review Exercises

I True or False

1. False	2. True	3. False	4. True
5. False	6. True	7. True	8. True

II Matching

9. F 10. C 11. G 12. D 13. B 14. E 15.

III Multiple Choice

16. C 17. E 18. B 19. B 20. C

IV Filling the Blanks

21. Population explosion
22. Pro-natalist population policy
23. Productive or economically active age group
24. Infant mortality rate
25. Asiatic population belt and Europe

V Work out

26. RNI = BR – DR

$$= \frac{47}{1000} - \frac{18}{1000} = \frac{29}{1000}$$

27. i. Crude density = $\frac{\text{Total population}}{\text{Total area in km}^2} = \frac{120,000}{5000\ \text{km}^2} = \frac{24\ \text{persons}}{\text{km}^2}$

ii. Agricultural density = $\frac{\text{Rural population}}{\text{Cultivated land area in km}^2}$

Rural population = Total population – urban population

= 120, 000 – 25,000= 95, 000

Agricultural density = $\frac{95,\ 000}{3000\ \text{km}^2} = \frac{31.7\ \text{persons}}{\text{km}^2}$

28. ADR = $\frac{\text{Old + Young}}{\text{Adult}} \times 100$

Total population = 100 million

Young population = 35% × 100 million = 35 million

Adult population = 40% × 100 million = 40 million

then the remaining population is 25 million, which is the old ones.

ADR (Average Dependency Ratio) = $\frac{\text{Old + young}}{\text{Adult}} \times 100$

$$= \frac{25\ \text{million} + 35\ \text{million}}{40\ \text{million}} \times 100$$

= **150%**

29. $\text{ADR} = \frac{\text{Old + young}}{\text{Adult}} \times 100$

$= \frac{7,500,000 + 22,500,000}{45,000,000} \times 100$

$= \frac{30}{45} \times 100 = \mathbf{66.7\%}$

30. $\text{SR (Sex ratio)} = \frac{\text{Male population}}{\text{Female population}} \times 100$

$88\% = \frac{\text{Male population}}{10 \text{ million}}$

Male population = 88% × 10 million

= 0.88 × 10 million = 8,800,000

Total population = male population + female population

= 8,800,000 + 10,000,000= 18,800,000

Check List

Check the student's performance according to the given competencies referring the questions under the check list for every unit. Put a tick (✓) mark against each task weather they are able to perform in the competencies of each unit. The students are expected to respond saying Yes or No. then, you can make your own evaluation whether the competencies are met or not.

Can you:

	Yes	No
1. Describe population growth trend of the world to show doubling time		
2. Compare population size of the world on continental bases? ----------		
3. Identify three leading populous countries in each continent? ----------		
4. Compare the population growth trend between Africa and Europe? ----		
5. Describe components of population change? ----------		
6. Compute natural increase rate of population? ----------		
7. Interpret population pyramids of developed and developing countries?-		
8. Discuss the factors affecting the spatial distribution of world population? ----------		
9. Compute crude and agricultural population density? ----------		
10. Realize cause and types of human migration? ----------		
11. Compare level of urbanization at continental level? ----------		
12. State factors affecting urbanization process? ----------		
13. Compare present population size of Ethiopia with the past? ----------		
14. Describe the spatial distribution of Ethiopia's population? ----------		
15. Show the demographic characteristics of Ethiopia's population? -----		
16. Analyse population structure of Ethiopia? ----------		
17. Realize population policy of Ethiopia? ----------		

Unit Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly. Thus

A student at a minimum requirement level will be able to compare population size of the world on continental bases and identify three leading populous countries in each continent. Describe population growth trend of the world to show doubling time and comport population trend between Africa and Europe. Describe components of population change and compute natural increase rate of population. Interpret population pyramids of developed and developing countries, discuss factors affecting the spatial distribution of population compute crude and agricultural population densities, and. realize causes and types of human migration. Compare level of urbanization at continental level and state factors affecting urbanization process compare present population size of Ethiopia with the past and describe the spatial distribution of populations of Ethiopia. Show and analyze demographics characteristics of Ethiopia's population. Realize population policy of Ethiopia.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to compute doubling time of world population to predict future population of the world and justify why and how population trend of Africa varies from that of Europe. Relate population pyramids with level of development and suggest possible mechanisms for the implementation of Ethiopian population policy in their locality.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue and achieve more.

Unit 4 ECONOMIC SYSTEM AND DEVELOPMENT

Total Periods Allotted: 6

1. Unit Introduction

Unit four includes three parts. The first part, Section 4.1, briefly discusses the three major economic systems of the world. The role of government and private sectors are treated in light of the main determinants of market variables.

Section 4.2: presents the issues of sustainable economic development by considering environment as an integral part of it.

Section 4.3: describes the roles and functions of the main actors of the current global economy like World Bank, International Monetary Fund (IMF) and World Trade Organization (WTO). The different aspects of globalisation are also treated in light of developed and developing countries.

Please encourage your students to interact and participate in the class discussions very actively. Give a chance to your students to present their arguments based on the various activities included in the unit.

2. Unit Outcomes

After completing this unit, students will be able to:

- *recognize the types of economic systems;*
- *state the concept of sustainable development and its indicators*
- *recognize the roles and contributions of world economic organizations and realize the concept of globalisation.*

3. Main Contents

4.1 TYPES OF ECONOMIC SYSTEMS

4.2 SUSTAINABLE ECONOMIC DEVELOPMENT

4.3 ECONOMIC ORGANIZATIONS OF THE WORLD

4.1 TYPES OF ECONOMIC SYSTEM

Periods Allotted: 2

1. Competencies

By the end of this section, students will be able to:

- *discuss the concepts of different economic systems;*
- *compare the types of economic systems;*

2. Content

- **Traditional Economy**
- **Market Economy**
- **Command Economy**
- **Mixed Economy**

3. Overview

To achieve economic growth and development, various countries follow different types of economic systems, such as free market, command and mixed economic systems. And each economic system has its own ways to answer the basic economic questions like *what, how, for whom* and *how much* is produced. These approaches enable the countries to see and solve their economic problems in different perspectives.

4. Teaching-learning Processes

4.1 Suggested Teaching Aids

Various important figures are included in the text book and so you have to use them as a teaching aids.

4.2 Suggested Teaching Methods

The main teaching methods suggested for this section are:

- Brainstorming
- Group discussion
- Explanation

4.3 Pre-lesson Preparation

- Prepare a diagram that shows the different economic systems of the world.
- Refer and read relevant materials that can help you to enrich the content of the lesson. Prepare additional activities that are local specific and plan how such activities can be treated by the students.

4.4 Presentation of the Lesson

a) Introduction to the lesson

To start the lesson, you may ask the students the following questions:

- What is the current economic system of Ethiopia?
- What factors affect the economic decisions of a society?

The above questions, which can be used as a brainstorming activity, enable you to identify the prior knowledge of the students on the issues and to guide the discussion accordingly.

b) Body of the lesson

Give the students a chance to define the term *economic system,* using their own words, and let them reflect their own ideas through interactive teaching.

After creating a common conceptual background, let the students continue the discussions in small groups, using the following questions:

- Compare and contrast the four economic systems of the world in light of their basic features and roles in the countries' economies.

Let some students present their findings and then you may summarize the main points using the following ideas:

- The *traditional economy* is practised by primitive people like the Karaharibushmen, which still use barter system.
- *Market economy* is characterized by private property, economic freedom, and decentralized decision-making, and price is determined by *the law of supply and demand.*
- In the *command economic system*, every economic decision, including supply and price, is determined by the government.
- In the *mixed economic systems,* both the government and the private sectors play important roles. The government may own key industries and intervene, when necessary, to prevent monopolies and to enure free competition.

c) Stabilization

Review the main ideas and concepts of the lesson.

- To achieve economic growth and development different countries use different systems; mainly free market, command and mixed economic systems. However traditional economic system is also practised by primitive people.

- Market economy is characterized by private property, economic freedom and decentralized decision making. It is highly criticized in its failure in ensuring equitable income distribution.
- Command economy is still exist in some countries where government controlled every resources and make economic decision (including market price) for the society as a whole. However, it is fading away in the world.
- In mixed economic systems both government and private sectors plays an important role in the economic life of a country in the system.

4.5 Evaluation and Follow up

a) Evaluation

- Give the students a kind of group assignment that enable them to know more about world economic systems.

b) Follow up

- Encourage students to participate in group discussion.
- Give them some hints about economic systems and facilitate their discussions accordingly.
- Coordinate the discussions and encourage the students to be an active participant.
- Grade and record every activity of the students.

Additional Activities

1. Describe briefly the main weakness of free market economy.
2. Why traditional economic systems still exist in some pocket areas of the world?

4.6 Answer key for Activities

Activity 4.1

1. Free market economy

Advantages	**Disadvantages**
- It is flexible to some extent. - Encourage individual responsibility for decisions - Avoid barriers for private investment - Increase the volume of export and import goods, etc.	- It doesn't enable to close the economic gap between the poor and the rich. - It threaten the survival of political freedom. Because it permits the accumulation of wealth by the few, etc.

2. The economic policy of:

Former government ("Derg")was:	Government of FDRE is
- Command economic system - All economic activities controlled and centrally monopolized by the government - No private sectors, etc.	- Exercising mixed economic system with having the ultimate goal of practising free market economy fully in the near future. - Private sectors are highly expanded and motivated - There are competitions between government and private sectors in the economy, etc.

In comparison, in the current government (FDRE) from 1991 onward, a promising economic progresses has been observed. Particularly in the areas of energy (like HEP) and infrastructure developments are among an exemplary achievements to be cited.

3. Practically Ethiopia still practices a mixed economic system as the way to free market economic system. This is because, the country was exercising command economy during the Derg regime and hence such economic legacy currently require transition time being fully replaced by the free market economic system.

Answer key for Additional Activities

1. One of the main weaknesses of free market economy is to leave everything to the private sectors and prevents any attempts of government interference even in time of series economic problems that arise from the failures of the system itself (e.g. the current financial crises of the western world).
2. The traditional or primitive people are still continues to live in isolation from the modern world. This isolation enables them to maintain their traditional economic system.

4.2 SUSTAINABLE ECONOMIC DEVELOPMENT

Periods Allotted: 2

1. Competencies

By the end of this lesson, students will be able to:

- *explain the concept of sustainable economic development;*
- *justify indicators of economic development.*

2. Content

- **Sustainable Development**
- **Indicators of Economic Development**
- **Levels of Economic Development**

3. Overview

Development is a difficult concept to articulate, but the most recent definition is stated as: Development is a whole package of change towards a better quality of life. To ensure this in a sustainable manner, environmental protection should be an integral part of the development process.

Using indicators of development, it is common to divide countries of the world into two or three groups. Namely, developed, less developed and least developed countries.

4. Teaching-learning Processes

4.1 Suggested Teaching Aids

Use the different figures indicated in the text book as teaching aids.

4.2 Suggested Teaching Methods

You are required to use the following teaching methods:

- Brainstorming
- Group discussion
- Independent tasks
- Pair discussions

4.3 Pre Lesson Preparation

- Make necessary preparations as stated in the previous lessons.
- On top of that, plan how the issues of sustainable development can be treated by the students in their local context.

4.4 Presentation of the Lesson

a) Introduction to the lesson

For a brainstorming activity, you may use the following questions:

- Why does Ethiopia lag behind in its economic development?
- How can we foster development in your locality without endangering the environment?
- What is the relationship between economic development and global warming?

The above start-up activity can enable students to reflect upon and share their prior knowledge among themselves.

b) Body of the lesson

Let the students discuss in group, based on the following questions:

- Using figure 4.1, define the term *development*.
- What is the relationship between development and other variables mentioned in figure 4.1?
- How can we maintain sustainable development at a global level?
- What roles should Ethiopia play in maintaining the global environment?
- How can we measure levels of development?

In addition to the aforementioned ones, it is advisable to pose more local specific questions in order to make the discussions more tangible in the eyes of the students.

- Facilitate the discussions, using the following important points:
- Development is a change towards a better quality of life, both materially and spiritually.
- To ensure sustainable economic development, more attention must be given to the environment, at every level.
- GDP, per-capita and standard of living are the measures used to group countries of the world into different levels of development.

c) Stabilization

Summarize the main ideas and concepts of the lesson.

- Sustainable economic development is a current paradigm for thinking about a future in which environmental, societal and economic considerations are balanced in the pursuit of development and improved quality of life.
- Standard of living, GDP and per capital income are the main indicators of development.
- GDP is the total value of goods and services produced by a country in a year, irrespective of who owns the out puts.
- Living standard is perhaps the best measure of the quality of life, which is directly related to the GDP and per capital income.
- Based on current status of development, countries of the world can be grouped as: developed, less developed and least developed.

4.5 Evaluation and Follow up

a) Evaluation

- Ask or give the students different activities and assignments related to the issues of economic development and environmental well being.

b) Follow up

- Divide the students into small groups, and let them discuss sustainable economic development, based on different perspectives.
- And grade every activity of the student.

Additional Activities

1. How do micro finance institutions foster development in Ethiopia?
2. What do you recommend to improve the role of adults in the development process of their country?

4.6 Answer key for activities

Activity 4.2

1. Because Ethiopia still couldn't adequately exploit its resources (both human and natural) due to socio-economic and cultural factors.
2. In general by developing hardworking habit inorder to ensure sustainable development.
3. By integrating and applying environmentally friendly technologies into various development programmes.
4. Economic developments that targets for short run economic gain (especially in developed countries) adversely affect the environment at world scale and there by resulted in global warming.

Activity 4.3

1. Since in Ethiopia the habit of job creation is extremely very low, seeking options among the limited job opportunities greatly erodes the attempts of developing hard working habit. In addition, lack of punctuality together with high frequency of holidays believed to retard the development efforts witnessed in the different economic sectors of the country.
2. - By expanding different vocational colleges across the country:
   - By establishing micro finance institutions to provide loans and there by facilitate job creation culture, etc.
3. Yes, it is possible, if only we use resources wisely and in a sustainable manner.

Activity 4.4

1.

Developed countries	Developing countries
They have very high; adult literacy, life expectancy and urban population. But their population growth rate is very low. As a result, high quality of life is common.	They have low percentages of literate people, life expectancy and urban population. As a result, mass poverty is very common, which is the direct reflection of both backward economic and social systems.

2. The developing countries have to:
   - Give more emphasise to improve the quality of education
   - Slow down high population growth rates through appropriate policy measures.
   - Develop small scale irrigations.
   - Integrate scientific method with indigenous knowledge and practices to protect the environment in a sustainable manner, etc.

Answer key for Additional Activities

1. Currently in Ethiopia, micro finance institutions have been playing a great role as a source of capital (especially for adults) which helps them to contribute a lot in the development efforts of the country.
2. - To provide the adult with a kind of education that enables them to create jobs.
   - To provide them information access that can help to update themselves, etc.

4.3 ECONOMIC ORGANIZATION OF THE WORLD

Periods Allotted: 2

1. Competencies

By the end of this lesson, students will be able to:

- *identify world economic organizations;*
- *realize the contribution of world economic organizations to development;*
- *discuss the concept of globalization;*
- *compare and contrast the advantages and disadvantages of globalisation.*

2. Content

- **World Bank, IMF and WTO**
- **Globalization**

3. Overview

There are three important actors who play important roles in the global economy: the World Bank, IMF and WTO. They are collectively known as Economic Organizations of the World.

The term *globalization* indicates the increasing interconnectedness of countries of the world interms of economy, culture, politics and infrastructure. Thus interconnectedness makes the world a *global village* which brings both advantages and disadvantages to the developing countries.

4. Teaching-learning Processes

4.1 Suggested Teaching Aids

It is advisable to use your own teaching aids and the text book.

4.2 Suggested Teaching Methods

Use the following as the main teaching methods in this lesson;

- Brainstorming
- Group discussion
- Debate
- Explanation

4.3 Pre lesson Preparation

- Try to read more from available sources about the main global economic actors.
- Prepare a diagram that shows the different functions and influences of world economic organizations.
- Adapt or prepare a diagram that shows the different functions and influences of world economic organizations.
- Plan and allocate enough time for students discussions.

4.4 Presentation of the Lesson

a) Introduction to the lesson

You may begin the lesson by asking the following questions:

- What are the issues raised in the previous lesson?
- Can you name an economic organization that serves at a global level?
- How can Ethiopia benefit more from globalization?
- What are the effects of globalization in your locality?

Through such introductory questions, students can be motivated to know more about the main actors of global economy.

b) Body of the lesson

Organize the students in small groups and let them discuss the following questions in detail:

- What are the roles of the World Bank, IMF and WTO in the World?
- How are the developing countries influenced by IMF in order to get loans?
- Does globalisation favor only the developed countries? Why?
- Is it possible to be free from globalisation? Why?
- How can Ethiopia compete in the globalized markets (both at local and world levels)?

- What are the advantages and disadvantages of globalisation to developing countries in general?

During the discussions, you have to draw the attention of students to the following points:

- The World Bank, IMF and WTO are collectively named as Economic Organization of the World.
- Both the IMF and World Bank usually impose certain conditions, like structural adjustment programmes, upon developing countries as requirements for obtaining loans.
- Globalization refers to the interconnectedness of countries of the world interms of culture, economy, infrastructure and politics.
- The developed nations benefit more from globalisation than the developing ones. But still there is room for developing countries to maximize their benefit by developing a hard-working habit and strengthening democratic cultures.

c) Stabilization

Review the main ideas and concepts of the lesson.

- The World Bank, International Monetary Fund (IMF) and World Trade Organization (WTO) are the main actors of world economy.
- The World Bank finance different projects across the world and provide low cost loans for health, education and other basic needs of the world's poor.
- IMF makes loans so that countries can maintain the values of their currencies and repay foreign debt.
- WTO is an international body that promotes and enforces provision of trade laws and regulations on its member states.
- No countries in the world could be free from the influence of globalization.

4.5 Evaluation and Follow up

a) Evaluation

- Let the students prepare a short report on the roles, functions and contributions of world economic organizations.
- Le the student have a debate about the merits and demerits of globalisation.
- Give the students different quizzes and tests.

b) Follow up

- Assist and encourage students to prepare a short report about the main actors of the Economic Organizations of the World.

- Form two groups and let them argue for and against globalisation in the class. Help them to support their arguments by citing relevant examples from their localities.
- Grade and record every performance of the students.

Additional Activities

1. How can Ethiopian farmers benefit from globalization?
2. What do you suggest to improve local products so that they will be more competent with foreign products in the domestic markets of Ethiopia?

4.6 Answer key for activities

Activity 4.5

1. Ethiopia can benefit from WTO (if it were one of the members) only when it able to produce quality products that full fill all the requirements of the international market.
2. Especially the music industry had been greatly affected from weak enforcement of intellectual property right laws. But currently some positive improvements are witnessed to improve the situations.
3. The kinds of measures to be taken to respect and enforce the copy rights laws at the grass root levels may include:
   - Awareness creation
   - Improving the existing laws, etc.

Activity 4.6

1. The Ethiopian exportable commodities are dominated by agricultural products (like coffee), which have faced strong competition from Latin American countries (such as Brazil) where globalization favoured them more than our country. In such situations, Ethiopia disfavoured from globalization. And also, western countries like the U.S.A., subsidize their farmers, which enable them to sell their agricultural products at low prices in the world market. In such situation the Ethiopian farmers also greatly disfavoured from globalization.
2. Developed countries have been able to diffuse their cultures and technologies across the different corners of the world and thereby adversely affect the local cultures to a considerable degrees.
3. Yes. Because it is known that the industrialized countries, which are the main emitters of CO_2, are responsible to the current global climate change. Because of this change, developing countries (like Ethiopia) have faced a series climatic variability and environmental degradations. To overcome these problems, the emitters have an obligation to provide financial and technical supports to the victim countries where by enable them to rehabilitate their environments.

Answer key for Additional Activities

1. Currently some western countries (like USA, Japan, etc) and china have given a chance to the Ethiopian agricultural products to enter in their markets without any tax payments. This encourages our farmers to send more and diversified products to these countries.
2. The local products can be competent by:
   - Improving their quantities
   - Providing technical and management training to the workers of manufacturing industries.
   - Creating incentive backed competition atmosphere among workers.
   - Wise use of resources
   - Producing environmentally friendly products, etc.

Answer Key for Unit 4 Review Questions

I. True or False

1. False 2. False 3. True 4. False 5. True 6. False

II. Matching

7. C 8. D 9. E 10. B 11. F

III. Fill in the Blank

12. Trade liberalization
13. Environment, economy and society
14. Free market
15. World Bank, IMF and WTO
16. Patents, copyrights and etc.

IV. Short Answers

17. By installing internet services in the school (which is a must nowadays), it is possible to benefit all the school communities. Especially, in the current globalized world to gain the latest information (particularly in the areas of education where other options are limited due to financial constraints and remoteness of the schools) via internet is the best and irreplaceable option. Because of this advantage, all the school communities have to do their best (in addition to the support given by the government) to access up to date information across the world.

18. In order to sell their agricultural products at lower prices in the international market. This enables them to monopolize the global market and influence up on the economic and political interests of the developing countries.

19. Currently, global environmental degradation is greatly believed to be the direct result of global warming caused by un sustainable economic development across the world. Such negative impacts are also prevailed up on the local environments in the form of rainfall variability (fluctuation), interruption of seasons, prolonging of drought, etc.

20. Not fair. Because it doesn't consider the actual interests of the developing countries and sometimes it may aggravates the economic and political instabilities of the countries.

Check List

Check the student's performance according to the given competencies referring the questions under the check list for every unit. Put a tick (✓) mark against each task weather they are able to perform in the competencies of each unit. The students are expected to respond saying Yes or No. then, you can make your own evaluation whether the competencies are met or not.

Can you:

	Yes	No
1. Discuss the concept of different economic systems? ----------		
2. Compare the types of economic system? ----------		
3. Explain the concept of sustainable economic development? ----------		
4. Justify the indicators of economic development? ----------		
5. Identify world's economic organization? ----------		
6. Realize the contribution of world economic organization to development?--		
7. Discuss the concept of globalization?----------		
8. Compare and contrast the advantages and disadvantages of globalization?-		

Unit Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly.

Thus

a student at a minimum requirement level will be able to discuss the concept of different economic systems and compare them, explain the concept of sustainable economic development and justify some indicators of economic development. Identify world economic organization and realize their contribution to development. Discuss the concept of globalization and compare and contrast the pros and cons of globalization.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to distinguish major similarities and differences among varied economic systems. Argue for/against the concept of sustainable economic development in relation to resource utilization and evaluate how world economic organizations contribute to the implementation of sustainable economic development.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue and achieve more.

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Minimum Learning competencies for Secondary Education First Cycle Grade 10 Geography

Theme	*Competencies* *Grade 10*
I. The concept of Geography	
II. Map Reading	• Indicate the location of places in relation to the True North on maps • Measure and calculate the directions and bearings on maps • Determine position on maps using Geographical and National Grids • Construct maps by enlarging and reducing techniques using square papers • Compare the traditional methods with contour methods to represent relief on maps • Apply methods of contouring to show different altitudes on maps based on basic properties of contours • Analyze different types of slopes by using gradient measurement
III. Physical Environment	• Evaluate the geological formation of the earth • Interpret the components of the physical environment of the earth • Select the appropriate means of classifying climate • Relate causes and consequences of climatic change • Discuss distribution of major elements and controls of climate of Ethiopia • Appreciate the spatio-temporal variation of climate in Ethiopia • Exemplify drought as one of the consequences of climatic change in Ethiopia. • Appreciate the diversity and productivity of ecosystem as a bases of economy.
IV. Human and economic aspects	• Evaluate trends and effects of world population numbers and patterns • Compute data of population variables to use for simple projection • Analyze the physical and cultural impact of human migration

Theme	*Competencies* *Grade 10*
	• Realize the causes and types of human migration and its effect on places • Construct and analyze population pyramids/structure to explain their connection with aspects of development. • Examine how the changing distribution of resources and socio cultural factors affect the pattern of population distribution. • Appreciate the size and function of urban areas • Compare and contrast the differing characteristics of settlement in developing and developed countries.
V. Public and policy related issues	• Describe the characteristics of economic systems • Discuss the concept of sustainable economic development and its indicators • Analyze the contribution of world economic organizations in connecting countries of the world.

Federal Democratic Republic
of Ethiopia
Ministry of Education

Geography Syllabus

For

Grade 10

Introduction

The purposes of first cycle secondary education are bridging general education to preparatory of higher education and to technical vocational education and training (TVET), and preparing learners to the world of work. This level is also the highest level of general education under the Ethiopian educational structure.

Geography, as component of general education, contributes to the realization of the above purposes. The unique nature of the subject geography helps learners form bases for the understandings, the interrelationship and interaction of phenomena in the society and the world. This condition plays important role in enabling learners to see their future choice of education carrier/training in the context of the well being of the individual and people in their respective as well as world society. It also enhance the presence of informed participation in relation to keeping local and global environment healthy for the sake of future generation. Within the framework of the above understandings, geography has been one of the subjects given in our schools.

Currently, quality has become an issue in our education system. Research and learning assessment reports (like national learning assessment and joint review mission of MoE) indicated us that the performance of learners was below what is expected. Besides, need assessment reports made in relation to the realization of geography curriculum has shown us the need for reviewing our curriculum. As a whole, all these reports forced us to revise our geography curriculum in line of competency based approach which is defined in our new curriculum frame work.

Thus, the present geography curriculum has been made suitable for the realization of active learning methods and out come based learning. The curriculum is also revisited to make it competent to the international standard. Moreover, it gives greater opportunity to teachers than the previous curriculum so that they can add their professional input and implement in a flexible way. The material is prepared by team of experts and teachers coming from MoE and regions.

For clarity purposes, this curriculum is made to contain:

- Profile of geography students at the end of grade ten which shows the contribution of attending geography lesson in realizing the expected general profile of learners at the end of the cycle ;
- Minimum learning competencies for geography education of the cycle;
- Content flow chart of the cycle;
- Grade level learning outcomes of each grade 10 ;
- The respective grade syllabuses.

Besides, the competencies and content flow chart are organized around five themes – The concept of geography, map reading, physical environment, human & economic aspects, and public and policy related issues. Using these themes, the syllabuses of grade 9 and 10 have been arranged in four units.

Thirty four weeks are assigned in a year to cover the lesson of each grade with two periods per week. The content load is minimized to be balanced with the allotted time.

Profile of Geography students at the end of Secondary School First cycle 10

- Students have general knowledge of geography that enable them to understand their natural and social environment
- Students are active participant in
  Social and cultural development of their country and Environmental protection
- Students play healthy role in the interaction between human and natural environments
- Students communicate with people using maps
- Students can live with people of diverse background by appreciating multiculturalism and value livelihood diversity
- Students can contribute their part in the effort of sustainable development of their country and the world
- Students utilize their geographical knowledge to connect social & natural phenomenon
- Students can be capable to continue technical training and prepare for further academic carrier using their geographical knowledge as a base.

First Cycle Secondary Education 10 Learning outcomes for Geography

After students study geography, at the end of first cycle secondary education the expected learning outcomes are that students will be able to:

- Develop a basic understanding of the geologic history of the earth in general and Ethiopia in particular;
- Analyze factors and processes of landform formation
- Comprehend the elements of weather and climate and the mechanisms that create discernible climate pattern in Ethiopia and the world at large.
- Relate major types of natural resources and associated problems and there by develop a set of values and feelings of concern for the resources and the motivation for actively participating in their protection;
- Realize some basic concepts, major theories as well as the impact of population growth on socio-economic development and the environment and measures taken to harmonize them in Ethiopia and the world;
- Appreciate major types of economic activities practiced in Ethiopia and the world at large, factors affecting their distribution as well as their levels of development;
- Acquire basic skills in understanding, reading, using and interpreting maps;
- Know the distribution and types of natural regions of the world and appreciate the unique feature of Ethiopia.

Grade level learning outcomes for grade 10 Geography

After completing grade 10 the students will be able:

1. **To develop understanding and acquire knowledge of:**

- The use of magnetic compass
- Geographical grid origin of Ethiopia
- Methods of showing relief on maps
- The term contour lines and its properties as well as its difference from isolines
- Ways of showing specific heights on contour maps
- The term slope, its types, and gradient
- The concept of universe and the position of the earth in the solar system
- The origin and structure of the earth
- Geological time scale and major events in the world and in Ethiopia
- The concept of continental drift theory, components of the earth's physical environment and major components of lithosphere
- Term rock, its classification based on nature of rock formation and its distribution in Ethiopia
- The term soil, its types, formation and composition
- Causes and consequences of soil degradation as well as ways of soil conservation in Ethiopia
- The criteria used for classifying climate and climatic classification
- Causes of climatic change and its consequences
- Spatiotemporal variation of temperature in Ethiopia
- Rainfall distribution of Ethiopia and factors why Ethiopia experienced different climate from other tropical countries
- Climatic zones of Ethiopia
- Reasons for the occurrence of drought, and drought coping mechanisms
- The concept of ecosystem
- How climate affect the distribution of ecosystem, the effect of latitude on its distribution and factors that affect the diversity of fauna, and flora in the ecosystem
- Factors that affect soil characteristics in the ecosystem
- Population size of the world on continental bases and the leading populous countries of each continent
- Population growth trend, its doubling time, components of its change and population pyramid of developing and developed countries
- Factors that affect population distribution
- The causes and types of human migration
- The term urbanization, its level and factors that affect its process
- The spatial population distribution of Ethiopia
- The concept and types of economic systems
- The concept of sustainable economic development and its indicators
- World economic organization
- Concept of globalization, its advantages and disadvantages

2. **To develop skills and abilities of:**
    - Finding direction on a map
    - Showing the direction of a given place on a map
    - Showing the position of places on maps
    - Computing the scale of the enlarged or reduced map

- Enlarge or reduce map using pantograph or square method
- Calculating altitude of points between contour lines
- Computing the gradient of slope
- Calculating field distance
- Computing natural increase of population
- Computing population density and agricultural density based on a given data
- Showing demographic characteristics of the Ethiopian population
- Analyzing population structure of Ethiopia

3. To develop the habits and attitude of:

- Willingness to communicate people using maps
- Appreciation to the origin & structure of the earth
- Appreciation for varied climatic conditions experienced in Ethiopia
- Concern for environmental protection
- Developing positive thinking to wards the implementation of family planning
- Realization of the population policy of Ethiopia
- Realization of the contribution of world economic organizations
- Sense of urgency towards the need for sustainable development
- Mental readiness of facing opportunities and challenges of globalization

Unit one: Map reading *(21 periods)*

Unit Out comes: **The Students will be able to:**

- Develop the skills of identifying direction and measuring distances on map, and practice, map enlargement and reduction
- Acquire basic skills of locating places and objects on maps using different methods
- Understand the different ways of representing relief on maps

Competencies	*Main contents*	*Suggested activities*
Students will be able to: • Acquire the skill of finding direction on a map • Show direction of a given place on a map by means of compass direction and bearings • Explain the use of magnetic compass • Practice how to find direction and bearings of points on maps	***1. Map reading*** **1.1 Directions on map** *(3 periods)* • Identification of direction • Measurement of direction and bearing	• Draw arrows indicating four cardinal points and twelve subsidiary points and give their degree values, justify these degree values by using geometric concept. Let students practice how to find direction and distance on maps.
• Define what geographical grid system mean • Demonstrate the position of a given place by means of geographic grid system	**1.2 Position on maps** (4 *periods*) • Geographic grid	• .Brain storming: Ask students to tell what they know about latitudes and longitudes with the geographical grid origin. Identify the location of a given place using the coordinate of latitude and longitude/geographical girds/.
• Define what national grid system mean • Show the position of places on maps using national grid references(four and six digits grid) • Demonstrate the national grid origin of Ethiopia	• National grid	• Draw vertical and horizontal lines to display national grids system and its origin (using the Ethiopian national grid system). • Let learners demonstrate the position of a point on maps using four/six digit grid reference system (facilitate conditions for such activities.)
• Enlarge and reduce maps using a pantograph or square methods	**1.3 Map enlargement and reduction** (4 *periods*)	• Let students discuss on the procedure used to

Competencies	*Main contents*	*Suggested activities*
• Compute the scale of enlarged or reduced map • Describe methods of showing relief on maps • Define the term contour lines • Discuss the properties of contour lines • Distinguish contour lines and isolines • Identify the different ways of showing specific height on contour map • Compute the altitude of points between contour lines • Explain the term slope • Demonstrate types of slope • Describe the term gradient of slope • Compute gradient of slope • Express gradient in different ways • Calculate field distance	**1.4 Relief on maps** *(10 periods)* • Traditional methods of representing relief on map • Contour as methods of representing relief • Properties of contours • Specific heights on contour map • Methods of findings altitudes of points between contour lines • Slopes and gradient • Slope and its types • Gradient • Field distance	enlarge and reduce map and encourage students to practice enlarging and reducing maps independently. • Ask students what they know about traditional methods of showing relief on map and demonstrate these ways of representing relief on map. • Facilitate condition to students so that they arrive at correct definition and properties of contour line. • Assist students to distinguish different ways of representing specific heights on contour maps in small group and then let them calculate altitude of points between contour lines individually. • Assign students to group discussion dealing with types of slopes by relating to properties of contour lines. • Help students describe gradient along various slopes so that they can compute and express gradient in different ways. • Ask students to recall what they know about finding distances on map and then guide them to calculate field distance between points.

Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly. Thus

A student at a minimum requirement level will be able to explain the use of magnetic compass, define geographical grid and national grid systems; and demonstrate the position of a given place using geographical grid system and national grid references (of four and six digits grid references); demonstrate the national grid origin of Ethiopia and practice how to find direction and bearings of points on maps. Enlarge and reduce maps using a pantograph or square methods, compute the scale of enlarged or reduced map, describe methods of showing relief on maps, define the term contour lines and discuss their properties. Identify in different ways of showing specific heights on contour map and compute the altitude of points between contour lines. Explain the term slope and types of slopes, compute gradient of slope and express it in different ways and calculate field distance.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to measure direction on maps using protractor, calculate magnetic declination of varied maps and find deviation from the true North. Compute scale of map using national grid references, construct a relief map using physiographic diagrams, and distinguish types of slopes from contour map of a given area.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue and achieve more.

Unit Two: Physical Environment of the World and Ethiopia *(26 periods)*

Unit Out comes: Students will be able to:

- Understand the origin of the earth and its tectonic movements
- Describe the movement, composition of the earth and components of its physical environment
- Discuss climatic classification, change and climate of Ethiopia
- Explain world factors that affect the diversity of Fauna, flora and soil in the ecosystem

Competencies	*Main contents*	*Suggested activities*
Students will be able to: • Discuss the concept of universe • Identify the position of the earth in the solar system • Explain the origin of the earth • Demonstrate the structure of the earth • Describe the geological time scale and major events • Describe the concept of continental drift theory • Realize the major geological events of Ethiopia • Distinguish the components of the earth's physical environments	***2. Physical environment of the world and Ethiopia*** **2.1 The earth in the universe** *(10 periods)* • Origin and structure of the earth • The geological time scale and major events • Movement of the continent • Geological events in Ethiopia • Components of the earth's physical environment – Atmosphere – Biosphere – Hydrosphere – Lithosphere • Lithosphere – Rocks – Soil	Brain storm: • Start the lesson by questioning students about the concept of universe and let students discuss the position of the earth in the solar system. This has to be followed by discussion on the earth. • Help students to discuss theory of continental drift and demonstrate using the huge continent of Laurasia and Gondwanaland. • Assist students when discussing the major geological events of the earth and Ethiopia. • Ask students what they know about the components of the earth's physical environment and let them list the names and in particular list the structural elements of Lithosphere (rock and soil).

Competencies	*Main contents*	*Suggested activities*
• Discuss major components of lithosphere • Define rock • Describe characteristics of each type of rocks • Classify rocks based on their formation • Demonstrate major rocks distribution in Ethiopia • Define soil • Identify types and formation of soil • Sort out the composition of soil • List the major soil types of Ethiopia • State causes and impacts of soil degradation in Ethiopia • Analyze the ways of soil conservation in Ethiopia	• Rocks – Definition – Types, formation & characteristics – Distribution of major rocks in Ethiopia • Soil – Definition – Types and formation of soil – Composition of soil – Major soil types of Ethiopia – Soil degradation and conservation in Ethiopia	• Let students collect and bring different types of rock specimen and classify accordingly. • Encourage students to demonstrate the major rocks distribution on the map of Ethiopia. • Ask the students to define soil and then assign students to collect soil specimen as to identify the types of soils. • Students are assigned in groups to discuss major types of soil in Ethiopia then present case study that shows soil degradation and soil conservation in Ethiopia.
	2.2 climate (6 *periods*) **2.2.1 Classification of climate of the**	• Ask students to review the concept of climate

Competencies	*Main contents*	*Suggested activities*
• Realize the criteria used for classifying climate • Compare the climatic classifications of the Greek's and Khoppen's	**world (2 perods)** • commonly used criteria for classifying climate – The Greek's – Khoppen's	and open classroom discussion that enable students understand the criterion used for classifying climatic regions using Greeks and Khoppen classification model. • Present Greek's and khoppen's climatic classifications to students using world map (the presentation has to be short and precise). Then allow students to compare them in groups. The result of the group work to be presented to the whole class. Teacher, will direct the discussion so that learners can catch at the desired points.
• Express causes of climatic change • Explain major consequences of climatic change	**2.2.2 Climatic change (4 periods)** • Causes of climate change – Natural cause – Human related causes • Consequences of climatic change – Global warming – Drought and desertification – Raising of sea level and flood – Shift of the direction of global winds – loss of biodiversity	• Organize students into small groups to prepare a short report on the causes and consequences of climatic change then let them discuss on what they submit and finally give a summary and consolidate the main points
• Describe the spatio- temporal variation of temperature in Ethiopia • Compare rainfall distribution of Ethiopia by place and time • Discuss factors why Ethiopia experiences different climate from other tropical countries • Differentiate	**2.3 climate of Ethiopia** *(6 periods)* • Distribution of major elements of climate in Ethiopia • Major climate controls in Ethiopia • Major seasons and climatic zones of Ethiopia	• Provide students with maps of rainfall regions of Ethiopia. • Use the experiences of four travelers to deal with the spatio-temporal variation of temperature and rainfall and then discuss factors and conditions of climatic aspects of Ethiopia. - Person A traveling from Ogaden to top of Bale mountains - Person B traveling from Ogaden to top of Mt. Intoto - Person C traveling from Gambella to Gore - Person D traveling from Semera to the highlands of Shewa& Wollo.

Competencies	*Main contents*	*Suggested activities*
climatic zones of Ethiopia • Show appreciation for varied climatic conditions experienced in Ethiopia otherwise found in tropical and temperate zone • Explain the reasons that drought is not necessarily followed by famine • Identify drought prone areas of Ethiopia • State drought coping mechanism in agriculture	• Drought in Ethiopia – Drought prone areas • Drought coping mechanisms **2.4 Ecosystem** (4 *periods*) • Factors that affect the distribution of ecosystem	• Let students discuss in groups and report about the experience of drought in Ethiopia and help them to identify drought prone areas in Ethiopia. Lead the discussion to deal on drought copying mechanism in agriculture and on why famine is not necessarily related to drought.
• Review the concept of ecosystem • Discuss how climate affects the distribution of ecosystem • Realize the effect of latitude on the variation of ecosystem • Explain the role of altitude on the distribution of ecosystem • Relate factors that affect the diversity of fauna & flora in the ecosystem • Identify factors that affect soil in the ecosystem	• Diversity of fauna, flora and the soil of ecosystem	• Present sample ecological areas (Congo basin, Kilimanjaro and Sahara desert) and let students discuss and report on the factors and variation of the characteristics of Fauna, Flora and Soil of each ecosystem

Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly. Thus

A student at a minimum requirement level will be able to discuss the concept of universe and identify the position of the earth in the solar system. Explain the origin of the earth and demonstrate the structure of the earth. Describe the geological time scale and major events and realize the major geological events of Ethiopia. Describe the concept of continental drift theory. Distinguish components of the earth's physical environments & discuss the major components of lithosphere. Define rock, describe its characteristics by types, classify rocks based on their formation, and demonstrate major rock distribution in Ethiopia. Define soil, identify formation and types of soils and list the major soil types of Ethiopia. State causes and impacts of soil degradation in Ethiopia and analyse ways of soil conservation in Ethiopia. Realize the criteria used for classifying climate, compare climatic classification of the Greek's and khoppen's. Express causes of climatic change, Explain major consequences of climatic change. Describe and compare the spatio-temporal variation of temperature and rainfall in Ethiopia, discuss the unique climatic experience of Ethiopia compared to other tropical countries. Differentiate climatic zones of Ethiopia, Explain the reasons that drought is not necessary followed by famine, and state drought coping mechanisms in agriculture. Review the concept of ecosystem and realize the effect of latitude and altitude on the variation of ecosystem. Relate factors that affect the diversity of fauna and flora in the ecosystem in the ecosystems.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to evaluate the convergence, divergence and transgress of continents in relation to the continental drift theory. Associate the distribution of major rocks of Ethiopia with its major geological events and state major soil characteristics of Ethiopia and suggest varied ways of soil conservation for each human intervention in urban and rural areas, in agricultural and industrial sectors. Compare and contrast the contribution of natural human factors for the aggravation of climatic change in Ethiopia. Argue for against various possible mechanisms of food self-sufficiency programs.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue & achieve more.

Unit Three: World Population *(15 periods)*

Unit Out comes: The students will be able to:

- Understand interpret size and trend of population growth of the world
- State the components of population change and compare the characteristics of population structure between developed and developing countries
- Show factors affecting spatial distribution of population and compute population densities
- Recognize and appreciate the process and development of urbanization
- Explain the general characteristics of population of Ethiopia

Competencies	*Main contents*	*Suggested activities*
Students will be able to: • Describe population growth trend of the world to show doubling time • Compare population size of the world on continental bases • Identify three leading populous countries in each continent • Compare the population growth trend between Africa and Europe.	***3. World population*** **3.1 Size and trend of population growth** *(2 periods*)	• Provide students with population size of the world starting from early time and encourage them to describe the doubling time. • Let students compare the population size of the world based on the given data and identify the three leading populous countries of each continent.
• Describe components of population change • Compute natural increase rate of population • Interpret population pyramids of developed and developing countries	**3.2 Components of population change** (3 *periods*) **3.3 Population structure** *(2 periods*)	• Let students discuss components of population change and then compute natural increase of the population of the world. • Demonstrate population pyramid of developing and developed countries, then interpret the data represented by pyramid. Finally discuss factors that affect population distribution. In addition, they discuss causes and types of human migration and compute population density and agricultural density based on the given data.

Competencies	*Main contents*	*Suggested activities*
• Discuss the factors affecting the spatial distribution of world population • Compute crude and agricultural population density • Realize cause and types of human migration	**3.4 Spatial distribution of world population and Population density** (4 *periods*) • Population distribution • Population density – Crude population density – Agricultural population density • Human migration – Causes – Types	• Present world population distribution map to the worlds and motivate students to discuss the factors affecting population distribution of the world. Then provide learners with data of population size so that they can compute crude and agricultural population density of some selected areas. • In relation to this activity help learners to identify and realize causes and types of human migration through discussion in small groups.
• Compare level of urbanization at continental level • State factors affecting urbanization process	• Urbanization	• Let students discuss the process and development of urbanization and then compare level of urbanization at continental levels. In addition, they discuss factors that influence urbanization process.
• Compare present population size of Ethiopia with the past • Describe the spatial distribution of Ethiopia's population • Show the demographic characteristics of Ethiopia's population • Analyze population structure of Ethiopia	**3.5 Population of Ethiopia** *(4 periods)* • Population size, distribution and growth rate • Birth and death rate • Measures of fertility and mortality • Population structure	• Arrange a time table showing series of population size of Ethiopia and let students compare the differences and deal with facts of population growth of the country. Similarly, select geographical areas from Ethiopia which show remarkable variations on population distribution and let learners discuss and reason out the possible causes for the variation in population distribution of Ethiopia. • Motivate learners to recall what they learned about birth and death rates and structure of human population. Then facilitate conditions that enable students show demographic characteristics of Ethiopia's population and analyze its structure
• Realize population policy of Ethiopia	• Population policy	• Students discuss size, distribution, demographic characteristics of Ethiopian population in groups and then the teacher summarizes the discussion by relating to the population policy of Ethiopia.

Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly. Thus

A student at a minimum requirement level will be able to compare population size of the world on continental bases and identify three leading populous countries in each continent. Describe population growth trend of the world to show doubling time and comport population trend between Africa and Europe. Describe components of population change and compute natural increase rate of population. Interpret population pyramids of developed and developing countries, discuss factors affecting the spatial distribution of population compute crude and agricultural population densities, and. realize causes and types of human migration. Compare level of urbanization at continental level and state factors affecting urbanization process compare present population size of Ethiopia with the past and describe the spatial distribution of populations of Ethiopia. Show and analyze demographics characteristics of Ethiopia's population. Realize population policy of Ethiopia.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to compute doubling time of world population to predict future population of the world and justify why and how population trend of Africa varies from that of Europe. Relate population pyramids with level of development and suggest possible mechanisms for the implementation of Ethiopian population policy in their locality.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue and achieve more.

Unit Four: Economic System and Development *(6 periods)*

Unit Out comes: The students will be able to:

- Recognize types of economic systems
- State the concept of sustainable development and its indicators
- Recognize the role and contribution of economic organization and realize the concept of globalization

Competencies	*Main contents*	*Suggested activities*
Students will be able to: • Discuss the concept of different economic systems • Compare the types of economic system	**4.*Economic system and development*** **4.1 Types of economic system** (2 *periods)* • Traditional • Free market • Command • Mixed	• Assign students to discuss on different economic systems in groups and let them make a comparison between the economic systems and then let the teacher summarize the main points.
• Explain the concept of sustainable economic development • Justify the indicators of economic development.	**4.2 Sustainable economic development** *(2 periods)* • Concept and indication of economic development	• Assist students to explain the concept of sustainable economic development and then let them identify the indicators of development in small groups.
• Identify world's economic organization • Realize the contribution of world economic organization to development • Discuss the concept of globalization • Compare and contrast the advantages and disadvantages of globalization	**4.3 Economic organization of the world** *(2 periods)* – World Bank, IMF,WTO – Globalization	• Let students write a short report on the role of world economic organizations and discuss their functions and contributions. • Let students debate on the merits and demerits of globalization.

Assessment

Students' performance has to be assessed continuously over the whole unit. The assessment will be made by comparing students' performance with the specified level of competencies. Besides, the teacher has to recognize the level of performance of each student and provide assistance accordingly. Thus

A student at a minimum requirement level will be able to discuss the concept of different economic systems and compare them, explain the concept of sustainable economic development and justify some indicators of economic development. Identify world economic organization and realize their contribution to development. Discuss the concept of globalization and compare and contrast the pros and cons of globalization.

In addition, a student working above the minimum requirement level and considered as higher achiever should be able to distinguish major similarities and differences among varied economic systems. Argue for/against the concept of sustainable economic development in relation to resource utilization and evaluate how world economic organizations contribute to the implementation of sustainable economic development.

Students working below a minimum requirement level will require extra help if they are to catch up with the rest of the class. Students reaching at the minimum requirement level but achieve a little bit higher should be supported so that they attain the higher achiever competencies. Students who fulfill the higher achievers' competencies also need special support to continue and achieve more