Achievers

Geography and Environment

Senior 1

Teacher's Guide

FOREWORD

Dear teacher,

Rwanda Education Board is honoured to present Senior one geography teacher`s guide which serves as a guide to competence-based teaching and learning to ensure consistency and coherence in the learning of the geography subject. The Rwandan educational philosophy is to ensure that learners achieve full potential at every level of education which will prepare them to be well integrated in society and exploit employment opportunities.

In line with efforts to improve the quality of education, the government of Rwanda emphasizes the importance of aligning teaching and learning materials with the syllabus to facilitate their learning process. Many factors influence what they learn, how well they learn and the competences they acquire. Those factors include the relevance of the specific content, the quality of teachers' pedagogical approaches, the assessment strategies and the instructional materials available. We paid special attention to the activities that facilitate the learning process in which learners can develop ideas and make new discoveries during concrete activities carried out individually or with peers. With the help of the teachers, learners will gain appropriate skills and be able to apply what they have learnt in real life situations. Hence, they will be able to develop certain values and attitudes allowing them to make a difference not only to their own life but also to the nation.

This is in contrast to traditional learning theories which view learning mainly as a process of acquiring knowledge from the more knowledgeable who is mostly the teacher. In competence-based curriculum, learning is considered as a process of active building and developing of knowledge and understanding, skills and values and attitude by the learner where concepts are mainly introduced by an activity, situation or scenario that helps the learner to construct knowledge, develop skills and acquire positive attitudes and values.

In addition, such active learning engages learners in doing things and thinking about the things they are doing and they are encouraged to bring their own real experiences and knowledge into the learning processes. In view of this, your role is to:

- Plan your lessons and prepare appropriate teaching materials.
- Organize group discussions for learners considering the importance of social constructivism suggesting that learning occurs more effectively when the learner works collaboratively with more knowledgeable and experienced people.
- Engage learners through active learning methods such as inquiry methods, group discussions, research, investigative activities and group and individual work activities.
- Provide supervised opportunities for learners to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.
- Support and facilitate the learning process by valuing learners' contributions in the class activities.
- Guide learners towards the harmonization of their findings.
- Encourage individual, peer and group evaluation of the work done in the classroom and use appropriate competence-based assessment approaches and methods.

To facilitate you in your teaching activities, the content of this teacher`s guide is self-explanatory so that you can easily use it. Even though this teacher`s guide contains the answers for all activities given in the learner's book, you are requested to work through each question and activity before judging learner's findings.

I wish to sincerely extend my appreciation to REB staff who organized the editing process of this teacher`s guide. Special gratitude also goes to lecturers, teachers, illustrators and designers who supported the exercise throughout. Any comment or contribution would be welcome to the improvement of this textbook for the next edition.

Dr. NDAYAMBAJE Irénée

Director General, REB

ACKNOWLEDGEMENT

I wish to express my appreciation to all the people who played a major role in editing process of this Geography teacher`s guide for Senior One. It would not have been successful without their active participation.

Special thanks are given to those who gave their time to read and refine this textbook to meet the needs of competence based curriculum. I owe gratitude to different Universities and schools in Rwanda that allowed their staff to work with REB to edit this book. I therefore, wish to extend my sincere gratitude to lecturers, teachers, illustrators, designers and all other individuals whose efforts in one way or the other contributed to the success of this edition.

Finally, my word of gratitude goes to the Rwanda Education Board staff particularly those from Curriculum, Teaching and Learning Resources Department who were involved in the whole process of editorial work.

Joan Murungi,

Head of CTLRD

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INTRODUCTION

This Teacher's Guide aims at guiding the facilitator or teacher on how best he or she can use the Geography Senior 1 Student's Book for Rwandan Secondary Schools which is a part of the Geography course at the Ordinary Secondary Level.

This Teacher's Guide is divided into two parts. The first part takes the facilitator or the teacher through the professional information that he or she needs to know. This information is used during the teaching and learning process. It is based on the competence based curriculum.

This guide is not a stand-alone text book. It has to be used hand in hand with the Student's Book. You are advised to plan for the lesson basing on the content under a given unit and the time allocated in the syllabus. It is important to note that the scheme of work has been changed into a unit plan and the lesson plan completely changed. These two documents are not related to the previously used formats.

You will also note that the time allocated to each unit is sufficient. The activities included in the Student's Book are also sufficient for the mastery of the required content. It is therefore imperative that as a teacher, you plan well to complete the required content in time. Some of the activities can be given to learners in the form of assignments and research work. This will demand that they be done outside the normal allocated classroom time.

Both the Student's Book and this guide have been written basing on competence based principles. This guide is meant to assist you in facilitating the learners to play a greater part in the learning situation. You should guide them to find solutions and answers to the tasks given as you inculcate in them critical thinking and problem solving skills among other competences.

The cardinal purpose of this guide book is to provide fundamental guidance on how you can handle the Senior 1 Geography content basing on the learner centred principles and practices.

The rationale of teaching and learning Geography is to assist the learners to undertake and understand the dynamics of their surroundings, hence being able to use the knowledge of Geography, skills, values and attitudes developed to utilise the environment they live in sustainably. This creates a basis for the occurrence of unified diversity.

The new Geography competence based curriculum advocates for continuity of the content across all levels of lower secondary. This implies that, the teacher will find given units in Senior 1 (in the Student's Book) in a less detailed form. This is due to the need to create an introductory foundation upon which other levels–Senior Two and Three will be based upon. Much of the work in the Student's Book intends to provide the

learners with knowledge, skills, values and attitudes on specific areas so that eventually they understand Geography as a subject and the physical and social environments as the places they live in.

The teacher is therefore required to guide the learners to learn Geography with the aim of making sure that it is reflected in their lives. This is possible when various activities included in the Student's Book are done and the teacher guides the learners to find solutions and answers on their own. This will make the content in the Senior 1 Geography Student's Book functional and relevant in the day to day living of the learners.

The Student's Book for which this guide is written has been written in a way that will enable the learners to develop various competences, skills, values and positive attitudes such as critical thinking, problem solving, communication and cooperation among others. This enables the learners to develop higher order thinking that will empower them to contribute towards the development of their country. This will assist learners to build the capacity to address challenges that for many years have been burdensome to the society. These challenges refer to environmental destruction and overpopulation.

1.1 Background to the Geography syllabus review

As Rwanda moves towards Universal Secondary Education and 12 years of basic education, it is imperative that those graduating from secondary schools are equipped with competences to ensure that they can be productive after graduation. It is on this quest that a careful review of the secondary school Geography syllabus was carried out to ensure that the key transferable soft skills that employers need are provided to all secondary graduates, academic skills as well as communication and teamwork skills.

The competences taught are influenced by factors that include relevance of the curriculum, the appropriate pedagogical approach by teachers, assessment strategies and the necessary and sufficient instructional materials.

A Geography competence based curriculum guides the development of competencies, associated with methodologies and assessment strategies that specify the outcomes which are consistent with personal, community and the labour market needs.

The Student's Book is written basing on the syllabus which offers learners the opportunity to apply what they have learned to real life situations and to make a difference in their own life. This is done with the help of teacher whose role is central to the success of the curriculum delivery. This Senior 1 Geography competence based syllabus, therefore, intends to equip learners with a combination of knowledge, skills, attitudes and values that a learner must demonstrate during and after each learning process. This enables them to accomplish tasks satisfactorily cognisant of personal characteristics such as motivation, self-confidence and willpower.

1.2 Rationale of teaching and learning Geography

Geography is the study of the earth including all the phenomena which make up the physical and human environment.

Geography helps the learners to understand the physical and social environment in order to build unity in diversity.

This teaching syllabus is intended to promote uniformity and continuity of content coverage for advanced level Geography. Geography is one of the disciplines that are concerned with the real world in which the learners live in and are capable of solving problems and developing knowledge, skills, attitudes and values which are relevant to their present and future lives.

The Geography competence based curriculum motivates learners to find out about the real world and enables them to recognise the importance of sustainable development for the future of mankind.

The Geography competence based curriculum also enables learners to develop generic competence skills, literacy and numerical skills to interpret the human and physical phenomena, maps, photographs and diagrams.

1.3 Broad Geography objectives and competences

The overall goal of Geography is to give learners the attitudes, knowledge and skills to act in a geographical way. During and at the end of the Lower Secondary level, learners taking Geography as a subject should be able to:

- Develop a strong interest in their surroundings at a local, regional and global level.
- Appreciate the variety of physical and human aspects of the world and acquire a commitment to sustainable development.
- Appreciate the relationships between people and the environment and appreciate the importance of geographical locations to human activities.
- Demonstrate an understanding of the physical and social environment in which they live in as well as appreciate the diversity and similarities in their communities, country, region, continent and the world.
- Be aware of land use practices and resource utilisation, their consequences in Rwanda and around the world.
- Analyse the impact of various socio-economic activities on sustainable development.
- Develop a variety of skills including critical thinking, research and problem solving, creativity, innovation, communication and co-operation. They are also taught how to present conclusions in the most appropriate way.
- Demonstrate awareness and show concern for environmental conservation and sustainability and act accordingly.
- Be competent in a range of skills and techniques necessary to carry out geographical research with data and interpret geographical phenomena.
- Read and interpret geographical data from geographical sources like maps, photographs, diagrams and field studies.

1.4 Specific competences and objectives

At the end of Senior 1, the learner should be able to:

- Demonstrate an understanding of the earth and the elements of physical geography.
- Explain the relationship between physical geography and human activities.
- Apply knowledge and understanding of the physical and human geography theory.
- Read and identify the elements of a map and interpret them.

1.5 The structure of the subject and format of the examination

There are two sections of Geography in Lower Secondary. The two include;

Physical geography which is also referred to as Paper 1. It includes;

- Practical geography: map reading and photographic interpretation.
- General physical geography of Rwanda.
- Physical geography of Africa.

Note:

Specifically, the Senior 1 Geography Student's Book, for which this guide is intended, covers only a part of physical geography. It provides an introduction of physical geography to the learners. The topics here include the following:

Topic area	Subtopic area	Unit	Number of periods
Practical geography	Map reading and photographic interpretation	Unit 1–Introduction to geography	3
	Map reading	Unit 2–Elements of a map	5
	Understanding the Earth and universe.	Unit 3–The Earth in relation to the universe.	12
	Understanding the Earth and universe	Unit 4–The structure of the Earth	4
	Relief	Unit 5–Forms of relief	6
	Rocks, weathering and soils	Unit 6–Rocks	5
	Weathering and soils	Unit 7–Soils	10
	Weather and climate	Unit 8–Weather and climate	23
	Vegetation	Unit 9–Vegetation	11
	Drainage	Unit 10–General organisation of hydrography	11
	Man and his environment	Unit 11–Hazards	5
Total periods for physical geography–S1			95

From the table above, 88% of the content covered in Senior 1 is physical geography.

The second section is on human and economic geography. This section is examined in paper 2.In Lower Secondary, it is composed of the following:

- Human and economic geography of Rwanda.
- Human and economic geography of Africa.
- Development case studies (Europe,the Americas and Asia).

In the Senior 1 Student's Book the topics of human and economic geography include the following:

Topic area	**Subtopic area**	**Unit**	**Number of periods**
Human and economic geography	Population, settlement and urbanisation	Unit 12– Population and settlement	8
	Economic activities and development studies	Unit 13– Economic activities	5
Total periods			13

Human and economic geography forms about 12% of the total content covered.

Therefore, Senior 1 Geography has 108 lessons as per the new competence based curriculum. The content in the Student's Book has been written to suit the level of the learners who have just left primary school and are in their first class in secondary school. The content is simplified. However, you are requested to use the methods that can make the content even simpler.

You should know that the Senior 1 Geography creates the introductory experience in the form of knowledge, skills, values and attitudes that will assist the learners to understand the content of Senior 2 and 3.

The Geography teacher handling Senior 1, should be aware that the content in this class forms the foundation for further studies in Geography. Learners should then be properly guided so that all the competences required for the subject are registered. This will be practically possible once all the activities designed for every unit are done by the learners.

1.6 Documents to be used in the teaching and learning of Geography

For successful teaching and learning of Geography to take place, the teacher should have the necessary professional documents which include the following:

1. A copy of the competence based curriculum framework.
2. A copy of the competence based Geography syllabus.
3. Senior 1 Geography Student's Book.
4. Senior 1 Geography Teacher's Guide.
5. The Geography content map.
6. The Geography unit plans.
7. The Geography lesson plans.

You are requested to prepare and use the samples of the professional documents especially the lesson and unit plans provided below to teach. You will notice that there are new changes that have been implemented in the design and format of the unit plan/scheme of work and the lesson plan. The changes were brought about by the introduction of the competence based curriculum.

Template of a competence – based lesson plan

School name: College De Nkanka **Teacher's name: M/S.** Murekatete Francine

Term	Date	Subject	Class	Unit N°	Lesson N°	Duration	Class size
1	01/02/ 2016	Geography	Senior 1.	1	1 of 5.	40 minutes	40
Type of Special Educational Needs and number of learners				Learners with hearing impairment:2 Learners with slight visual impairment: 1			
Topic area:	Practical Geography						
Sub-topic area:	Map reading and photographic interpretation						
Unit title	Introduction to Geography						
Key unit competence:	To be able to determine the importance of Geography and its relationship with other subjects.						
Title of the lesson	Introduction to Geography						
Instructional objective	Learners should be able to use Geographical documents, Internet and the school's surrounding to identify different geographical aspects and their interrelationship appropriately.						
Plan for this class (location: in / outside)	Inside the classroom						
Learning materials (for all learners)	Geographical documents, maps, Internet, local environment, GPS, talking and tactile materials and objects.						
References	- Achievers Secondary,Geography and the Environment For Rwanda Student's Book 1 - Dictionary of the Earth Science 2nd Edition Oxford University press, London. - Introduction to Geography by Citation (2006).						

Timing for each step	**Description of teaching and learning activity**		**Generic competences and cross-cutting issues to be addressed**
	The learners organised into pairs, and groups will be engaged in oral diagnostic questions on their physical environment to identify the geographical aspects. They will be able to identify the relationship existing between those aspects and man's activities hence being able to create a vision of the branches of Geography.		
	Teacher's activities	**Learner's activities**	

Introduction 6 mins	- Ask the learners to use their environment to visually identify things they can see in their environment that are related to Geography. They should give their answers orally. - Weigh the answers given by the learners and give the appropriate lesson title.	- Answering the questions asked by the teacher. - Learners go to the field to do the practical activities. - Predict the day's lesson.	- Critical thinking and problem solving skills (through questioning and answering). - Cooperation (through group work). - Communication skills including listening (discussion, presentation predicting and brainstorming).
Development of the lesson 30 mins	- Put the learners into groups of three based on the requirements of inclusive education and guide them to do the activities 1.1, 1.2 and 1.3 on pages 2-3 of the Student's Book. - Allow them time to do the activity. - After the activity, allow the members of the class to make brief presentations on their findings in class. - Allow other members to comment on the other groups' presentations. - **Special Education Needs Cases (SEN)** - Sit the group with both the visually impaired and learners with hearing impairment at the front of the class and pay special attention to them.	- Listening - Taking notes - Answering and questioning **Special Education Needs Cases (SEN)** - The visually impaired learners sit at the front of the class. - The learners with the hearing impairment should be given written copies of the topics discussed in groups.	- Critical thinking and problem solving skills (through questioning and answering). - Cooperation (through group work). - Communication skills including listening (discussion, presentation, predicting and brainstorming). - Environment, climate change and sustainability (through identifying various geographical aspects and the need to protect and conserve them).
Conclusion 4 mins	- Summarise the lesson on the definition of Geography. - Ask the learners to prepare for the next lesson on the branches of Geography.	- Noting down the main points of the lesson. - Cleaning and rearranging the classroom.	- Communication skills (asking and answering questions) - Cooperation (through teamwork.)
Teacher self-evaluation	Basing on the answers provided by the learners during the execution of diagnostic evaluation in the course of the lesson, the objectives of the lesson were achieved. Therefore, the lesson was well taught.		

1.6 Competence-based assessment

This is an assessment process in which a learner is confronted with a complex situation relevant to his or her everyday life and asked to look for a solution by applying the competences that have been learned in class. The competences learnt include; knowledge, skills, values and attitudes. Evidence of learning is then collected and used as the basis on which judgments are made concerning the learners' progress against fixed performance criteria.

1.6.1 When to assess

During the teaching and learning of Geography, assessment should be clearly visible in the lesson, unit, term and yearly plans. Competence based assessment in Geography can be as follows:

- **Before learning (diagnostic):** These are administered at the beginning of a new section of work**.** These questions are meant to find out what the learners already know and can do. They are also meant to check whether the learners are at the same level of understanding.

  You can either use:

  (i) Probing questions when a unit or topic is being introduced for the first time. For example; What do you understand by the term Geography?

  (ii) Recall questions about the previous lesson**.** For example; Do you remember the characteristics of a good map?

- **During learning (formative or continuous):** These questions are used when learners appear to be having difficulties with some of the work. They are also used to gauge the level of understanding of the learners as they go on with the topic of study. They are presented as continuous assessment tests. The assessment aims at giving learners support, reinforcement and feedback. For example: In pairs, discuss the factors that influence population distribution in any place.

- **After learning (summative):** This assessment is administered at the end of a section of work or a learning unit. The teacher has to assess after the learning. This is also known as *Assessment of learning* to establish and record the overall progress of learners.

  For example: **End of unit revision task**

  1. With specific examples, describe the tundra climate.
  2. State the characteristics of alpine climate and show how it has influenced land use in areas where it occurs.
  3. Explain how climate has influenced human activities in the world.

1.6.2 What to assess in Geography

(a) Knowledge and understanding

This assessment should focus on correctness of answers, coherence of ideas, logical reasoning and understanding. The teacher should use high order thinking verbs like: identify, explain, indicate,

discuss, predict, estimate and judge to test the learners' level of understanding.

(b) Practical skills

In this assessment, learners should show evidence of the ability to perform and accomplish a given task through aptitude and the use practical tests and evaluation of the final outcome of learning. The assessment should focus on accuracy, quality products, correctness, speed , efficiency, teamwork and coherence.

For example in Unit 3:

Activity 3.25

Work in pairs.

Describe the shape of each of the following.

(a) Eggs

(b) Oranges

(c) Water melon

(d) Football

(e) A square wooden board.

(c) Attitude and values

This assessment should focus on the learner's approach to a situation, appreciation of the task given, impression of a situation, manipulation, reasoning, persistence and tolerance.

(d)Generic competencies

This assessment tests the judgment and capacity. It uses verbs like; arrange, develop, subdivide, point out, design, produce, organise, develop, integrate, apply, discover, survey and produce; depending on the generic competence assessed.

The knowledge, skills, attitudes and generic competences are not assessed independent of each other. It is important to set tasks which give evidence of the key aspects of topics or units.

The lesson, unit or subject concept is the major focus of study. However, the style of assessment especially through questioning shows the components that are assessed. It is possible that one question can cover the concept, all or part of generic competences, attitude and practical skills.

One must ensure that the verbs used in the formulation of questions do not require memorisation or recall answers only but also test on skills and attitudes as well as generic competences as stated in the syllabus(e.g. arrange, point out, design, draw, organise, tabulate, develop, integrate, apply, discover, survey, produce, examine, discuss, analyse, justify, create, perform, conduct, prepare, differentiate, relate, compare and contrast, suggest, comment on, show and match). For example in unit 4, Activity 4.4

1.6.3 Instruments of assessment in Geography

Instruments of assessment are the tools used to establish whether learning has taken place. These can be used before, during and after learning. The teacher can select the appropriate instruments to use in assessment. The following are some of the instruments that can be used in assessment of Geography.

(a) Observation

This is where the teacher gathers information by watching learners interacting, conversing, working or playing. A teacher can use observation to collect data on behaviours that are difficult to assess by other methods such as attitudes, values, generic competences and intellectual skills. Observation is a very important tool because it can be used before the lesson begins and also throughout the lesson since the teacher has to continue observing each and every activity.

(b) Questioning

(i) **Oral questioning:** This is a process which requires a learner to respond verbally to questions.

(ii) **Class exercises:** These are tasks that are given during the learning and teaching processes.

(iii) **Quizzes:** These are short and informal questions usually asked during a lesson.

(iv) **Homework and assignments**: These are tasks that are assigned to learners to be completed outside the lesson. These may include some reading, writing, problems to be solved, a school project to be built for display, drawing or other skills to be practiced.

A good question item in Geography should be:

- clear, simple and straight forward
- short and precise
- free of bias
- readable
- original
- indicate marks for each question
- follow order of difficulty (Blooms taxonomy)
- contain a variety of verbs.

(c) **Portfolio:** Learners' portfolios are a collection of evidence, prepared by the learners and evaluated by the teacher to demonstrate mastery, comprehension, application and synthesis of a given set of concepts.

(d) **Project work:** A product which requires a learner to plan, carry-out and make a project presentation which is then assessed by the teacher or by peers.

(e) **Interview:** A process where a learner is expected to respond to questions concerning his or her learning.

(f) **Role play:** A performance which requires a learner to act out roles of other people in society in order to learn from their experiences. For example learners may dramatise the banking process showing the roles of various people and documents used.

(g) **Debate**: A performance which puts one learner or team of learners, against each other so that they logically argue issues.

1.6.4 How to plan an assessment in Geography

The process of planning an assessment involves a number of steps depending on the type of assessment. The steps include the following:

- Design tasks, set criteria, design rubrics and prepare appropriate questions beforehand. After this then decide how and when they are to be administered.

- Choose an appropriate method and technique to use either by observation, dialogue and interactions with learners, organising practical investigations, presentations and discussions, oral questioning or written quizzes, exercises and tests.
- Make provision for the learners' roles in self-assessment and peer assessment.
- Develop assessment schemes for written work and products such as artworks, case studies, reports or project work presentations.

1.6.5 How to develop tasks in Geography

Use observable action verbs consistent with the level of learning expected. Consider all the low, medium and higher order thinking skills and competencies.

Examples of verbs used in setting tasks and criteria include the following:

(a) Low order (knowledge and understanding): define, name, list, identify, label, match and outline. For example:

- Name the elements of a good map.
- Outline the factors that influence rainfall formation.

(b) Medium order: explain, describe, examine, classify, express, summarise, compute, relate, show, solve and use. For example:

- Using specific examples, examine the influence of rainfall distribution and availability on the economic development of a country.

(c) Higher order: compare, analyse, illustrate, differentiate, compose, construct, design, formulate, evaluate, justify and interpret. For example:

- Differentiate between tropical cyclones and local winds.
- Analyse the effects of a high population on the social and the physical environment.
- Design a project that will assist in solving an environmental degradation problem in your school.

1.7 Developing competences

A competency is a combination of knowledge, skills, attitude and values that a learner must demonstrate during and after each level of the learning process. Competencies enable the learners to accomplish tasks satisfactorily.

Basic competences: These are addressed in the stated broad subject competences and in the objectives highlighted on a yearly basis as well as in the units of learning.

Generic competences: These are basic competences that must be emphasised and reflected in the learning process. Teachers should ensure that learners are exposed to tasks that help the learners acquire the skills for example entrepreneurship. They are briefly described below.

1.7.1 Generic competences

(a) Critical and problem solving skills: The acquisition of such skills will help learners to think imaginatively, innovatively and broadly to evaluate

and find solutions to problems encountered in their surrounding and everyday life. For example, Activity 1.2 in Unit 1.

(b) **Creativity and innovation:** The acquisition of such skills will help learners to take initiative and use their imagination beyond the knowledge provided the classroom to generate new ideas and construct new concepts. For example Activity 1.3 Unit 1, enables individual learners to develop their creativity and innovation.

(c) **Research:** This will help learners to find answers to questions based on existing information and concepts. Learners can then be able to explain phenomena from the information that they have gathered. For example, Activity 1.7 in Unit 1.

(d) **Communication skills:** All teachers will ensure the proper use of language in the process of learning. The teachers should communicate clearly and confidently and convey ideas effectively through both spoken and written language. They should apply appropriate language and relevant vocabulary when teaching. For example, there are written passages in the Student's Book that are meant to assist in the development of communication skills such as reading, listening and giving feedback. The teacher is encouraged to engage the learners to tell their own stories in the proper and official language. For example the case study on pratical geography of the Senior 1 in Student's Book, is meant to test for comprehension of concepts learnt in the unit.

(e) **Cooperation, interpersonal management and life skills:** This will help the learner to cooperate as a team member in whatever task that he or she has been assigned. Learners will also practice positive ethical and moral values while respecting rights, feelings and views of others. They will perform practical activities related to environmental conservation and protection and respond creatively to a variety of challenges encountered in life.

(f) **Lifelong learning:** The acquisition of this skill will help learners to update their knowledge and skills with minimum external support. The learners will be able to cope with the evolution of knowledge advances for personal fulfillment in areas that are relevant to their own improvement and development.

Competences are acquired over time through the cumulative effect of a competence approach to learning. It should be noted that competences are rarely developed in isolation. They are interconnected and developed simultaneously.

Developing all competences in Geography requires teachers to adopt approaches that encourage and enable learners to think critically, to carry out research, to solve problems, to be creative and innovative, to communicate and to cooperate. It requires setting learning activities that will develop knowledge, skills and values as well as generic competencies by adopting approaches that encourage and enable learners to engage in active learning.

1.7.2 The role of teachers in developing competences in Geography

Teachers are adviced not to teach the way they were taught. They must embrace the new approaches with the aim of developing competences in the learners. This requires them to shift from teacher-centred to learner-centred methods of teaching. The following are important points to consider while implementing the competence-based curriculum:

- From the syllabus units, the teacher identifies different competences to be developed by the learners which are fostered by engaging learners through inquiry methods, group discussions, research, investigative activities and group and individual work and activities.
- The teacher focuses on observation of evidence on what learners can do and then identifies any difficulties encountered by them so that appropriate strategies can be developed for those with special needs (slow learners, learners with disabilities, talented and gifted learners).
- The teacher should take into account different cross-cutting issues and integrate them in the learning activities where applicable. In this case, in geography environment and sustainability is closely related to this subject.
- The teacher should encourage individual, peer and group evaluation of the work done in the classroom. The teacher must also use appropriate competence-based assessment approaches and methods.
- The teacher is a facilitator and a guide in the learning process. He or she must provide supervised opportunities for learners to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.
- The teacher is an advisor and provides guidance and counselling for learners. The teacher supports and comforts learners by valuing their contributions in the class activities.
- The teacher acts as a parent and has to ensure discipline, follow up learners' behaviour and communicate with parents about the learners' performance at school.

Note

The teacher should ensure that during the teaching and learning process,learners communicate and share relevant information with other learners through presentations, discussions, group work and other learner centred activities (role play, case studies, project work, research and investigation).

- Learners are active participants and take some responsibility for their own learning.
- Learners develop knowledge and skills in active ways.
- Learners carry out research and investigation, consulting print and online documents as well as resourceful people and present their findings in class.
- During the assigned tasks, learners ensure the effective contribution of each group member, through clear explanations and arguments, critical thinking, responsibility and confidence in public speaking.

1.7.3 Strategies to develop the competence according to the domains of learning in Geography

Domain of learning	What teachers can do	Examples of learning activities
Psychomotor domain	• Allow the learner to practice for a while and then ask for a demonstration of the skill. • Set up models or create a simulation exercise in the practical school garden or geographical demonstration garden where learners can have repeated practice of skills with peers under the teacher's supervision. • Arrange for sufficient practical experiences requiring skill performance under direct supervision. • Create a valid and reliable assessment tool for use in determining competence in skill demonstration.	• Observe a skill and attempt to repeat it, or see a finished geographical project and attempt to replicate it (imitate) such as an environmental conservation club in another school. • Produce the product or the project by following general instructions rather than observation (manipulate). • Performing individual or group practical work to demonstrate particular skills under direct supervision of the teacher (manipulate). • Making models or designs related to the broad competence or specific learning outcomes with accuracy (precision). • Make accurate observations and draw appropriate conclusions from practical demonstrations of a task by a teacher or fellow learners (manipulating with precision). • Studying situations through field visits and case studies. • Undertaking project work with guidance from the teacher but with minimum supervision.
Cognitive domain	• Develop case studies requiring discovery or problem-based learning to determine the most appropriate evidence based example. • Structure debates that require the learner to provide reasons for their responses. • Avoid the temptation to answer every learner's question, especially when the learner knows or should know the answer. • Set self-study modules with suggested learning activities that the learners can complete on their own prior to interaction with fellow learners and teachers. • Provide ample time for discussion and clarification of concepts to be learned. • Help learners to use their own knowledge and ideas to find possible solutions to situations. • Guide learners to discover how to proceed or act through higher order questioning (Socratic questioning).	• Self-directed reading and completion of suggested activities that will add to learners' knowledge and experience base. • Active participation in learning and taking responsibility for their own learning. • Discovering the best solution to a given need or problem in both theoretical and practical work. • Retrieving and retaining knowledge and applying it in practice. • Learning activities structured for groups of learners working together and self-directed using the World Wide Web or Internet and Intranet for resources related to topics being learned. • Preparing for discussions and debates.

Affective domain **(Attitudes and values)**	• Create an environment for learners to do exercises on positive and negative personal and peer values. • Provide a framework for a written analysis of attitudes, values and behaviour. • Structure opportunities for role play requiring recognition of differing values and behaviour. • Join with learners groups to discuss different values and beliefs especially those related to learning styles and interpersonal relationships. • Create a valid and reliable assessment tool for use in determining positive attitude demonstration.	• Respond willingly and positively when asked or directed to do something. • Comply with given expectations by attending or reacting to stimuli in an agreeable manner. • Display behaviour consistent with attitudes and behaviour that is acceptable in different situations. • Listen to others and pay attention to any guidance and advice given by mentors. • Reflect on how personal values promote or inhibit their ability to learn better and to fit in society. • Identifying role models in the school system and in the community and listing the qualities they admire.

1.7.4 Techniques of developing competences in Geography

The teacher can use the following techniques while teaching Geography that support the development of competences:

Techniques/ Strategies	Description
Roundtable	This is a form of cooperative learning. A question is posed by the teacher to groups of learners. Each person in the group writes one answer on a paper and passes it to the next team member. The group looks at each answer and decides which one to present to the class. Each group shares or presents their answer to the entire class. The suggestions are discussed by the class and conclusions drawn.
Questions in corners	The teacher places questions in different corners of the classroom. Groups of 3-6 learners move from corner to corner as per the signal given by the teacher. They discuss and write an answer to each question taking into account answers already written by previous groups. The use of different coloured markers for each group helps to see what each group wrote for each question. Ideas for each question are discussed in a plenary to come up with some conclusions at the end.

Outdoor activities and field visits	In field visits, learners go outside the classroom to observe specific geographical aspects or phenomena, or to hear information from experts. Before the visit the teacher and learners do the following: • select the topic of study • agree on aims and objectives • gather relevant information prior to the visit • brainstorm on key questions and share responsibilities • discuss materials needed and other logistical issues • discuss and agree on accepted behaviour during the visit. After the visit: • de-brief and discussion of what was learned and observed • evaluation of all aspects of the visit • reports and presentations prepared by learners.
Project work	Learners in groups or individually, are engaged in self-directed work for an extended period of time. This is usually meant to investigate and respond to a complex question, problem or challenge. The work is presented to classmates and other people beyond the school. Projects are based on real-world problems that capture the learners' interest. This technique develops higher order thinking as the learners acquire and apply new knowledge in a problem-solving context. The teacher plays the role of facilitator by: • working with learners to frame worthwhile questions • setting relevant and meaningful tasks • availing the resources needed • coaching both knowledge and skills development • assessing carefully what learners produced based on defined criteria
Group work	This is a form of peer, cooperative or collaborative learning that values learner to learner interaction. It is mutually beneficial and involves the sharing of knowledge, ideas and experiences between learners. It offers learners the opportunity to learn from each other. To be effective, teams should be heterogeneous in terms of ability levels, made of 3-4 learners in most tasks. Team members are assigned specific roles which are rotated. For elaborated work, assessment should be two-fold; based on both the collective and individual work.

Role play	Role play is a special kind of case study in which there is an explicit situation established with learners playing specific roles. The case study differs from the role play because in the case study, learners read about situations and characters. In the role play, they find themselves what to say, how to play and the materials to use. For example, acting as a REMA officer who is faced with challenges of population encroachment on the buffer zones of Nyungwe National Park.
Case study	Case study as a learning technique is a story that is either based on real events or from a construction of events which could take place. It involves issues or conflicts which need to be resolved. The information contained in a case study can be complex or simple. The teacher presents a problem situation and indicates how to proceed.
Brainstorming	This is a technique used for creative exploration of options and solutions in an environment free of criticism. It encourages creativity and a large number of ideas. Among ground rules there are; active participation by all members; no discussions, criticisms, compliments or other comments during the brainstorming stage. The teacher starts by reviewing the rules, sets a time limit; states and explains the question; collects and displays ideas; eliminates duplications and guides learners to draw a conclusion.
A learning centre/ corner	This is a space set aside in the classroom that allows easy access to a variety of learning materials in an interesting and productive manner. Learners can work by themselves or with others in self- directed activities on content related to the curriculum or on different content that is related to the subject. These centres allow learners to deepen their understanding of subjects, apply their learning in a stimulating learning environment and engage in meaningful discoveries that match their individual interests. They provide learners with hands-on experiences that they can pursue at their own pace and level of curiosity.
Games/play	Games are used to help learners to learn faster and better and in enjoyable manner. Games/plays help to create a classroom experience that actively engages learners. They develop communication and other important skills such as social skills, critical thinking, problem-solving, numeracy and literacy skills in different subjects.
Research work	Each learner or group of learners is given a research topic. They have to gather information or ask experienced people and later present the results in a class discussion.
Practical work	Individually or in teams, learners are assigned practical tasks. To be effective, a task needs; a clear purpose with strong links and relevance to the curriculum; quality materials; learners' engagement; time for preparation and carrying out the work and support from the teacher or other experts. Such activities encourage deeper understanding of phenomena and developing skills such as observation, practical work, planning and reporting.

1.8 Resources

Learning/teaching materials/resources refer to a variety of educational materials that teachers and learners use in the classroom to support specific learning objectives. The learner–centred approach in the Geography syllabus delivery emphasises the need to use a variety of teaching and learning resources including those improvised or collected by the teacher and the learners from the surrounding environment.

1.8.1 Identifying resources

Before planning and delivering a lesson, resources should be identified at school or in the surrounding environment according to the lesson. Examples of resources a teacher can use in the teaching/learning of Geography may include the following:

- Library: Textbooks, dictionaries, reading books, reference books, newspapers, maps, atlases, charts and globes.
- ICT equipment (laptop and desktop computers, projectors, mobile devices, Interactive White Board (IWB), television, radios, smart boards, smart phones, mobile phones, CD-ROMs, flash disks, digital cameras etc.)
- Digital (electronic) materials: audio, video, interactive, simulators, animations, digital images, Internet content, software, Powerful Presentation Techniques (PPT), DOC, etc.
- Real objects: fruits, plants, sticks, rocks, clothing, food packaging and plastic bottles, etc.
- Materials from the environment such as soil, vegetables, animals, home/ domestic objects.
- Human resources: learners and people in the local community who include parents, local leaders, role models and workers within the school.
- Physical, human and economic wall maps of Rwanda, the different continents and the world .
- Photographs (ground, aerial and oblique).
- Models from the local environment such as rocks, minerals, soils samples, etc.
- Ordinary survey maps (O.S.M).
- Measuring instruments: rain gauge, thermometer, barometer, hygrometer, wind vane, anemometer, compass, clinometers and GPS.
- Stationery: manilla paper, flip charts, etc.
- Adaptive materials: tactile and talking materials like talking globes, tactile maps, tactile illustrations and braille equipment and materials.
- Prepared stories about geographical phenomena such as companies and farmers that have been successful–case studies.
- Prepared content for learners to role play.

From the available resources, a teacher has to select materials considered to be the best and most suitable for the particular learning activity and reject what is inappropriate or unsuitable.

1.8.2 Opportunities for sharing resources

- Sharing among teachers within a school and across schools.
- Borrowing or consulting from other institutions and the community.
- Inviting guest speakers, parents or anyone with expertise.
- Conducting site visits to different locations or tourist attractions within the community.
- Sharing resources using ICT (soft copies, internet, telephone etc.)

N.B: Teachers are encouraged to be creative and innovative and to use the available resources in their environment, be it in the classroom, at school or within the community. Geography can be best learnt from the environment or using the locally available resources so that learners see it functional and relevant in their lives. Between a teacher who uses a globe and the one who uses a pumpkin to demonstrate the shape of the Earth, the one who uses a pumpkin makes Geography real and connects it with the life of learners.

1.9 Inclusiveness in the class

1.9.1 Inclusive education

Inclusion is based on the right of all learners learning together for a quality and equitable education that meets their basic learning needs and understands the diversity of backgrounds and abilities. All learners have the right to access education regardless of their different impairments. This implies that all citizens benefit the same menu of education programs.

It is therefore, very important for the teacher of Geography to have an inclusive Geography class and design activities, revision tasks and exercises that will allow all the learners to participate and benefit equally.

1.9.2 Special educational needs

Special educational need(s) refers to the needs of learners who have learning difficulties or disabilities which make it harder for children to learn in the same way as their peers of the same age.

Categories of special educational needs that are likely to be met in a Geography class include the following:

(a) **Visual impairment (low vision, totally blind):** These learners are unable to see the blackboard and cannot move around the school environment without mobility and orientation skills. They also cannot read print textbooks and cannot write in notebooks.

(b) **Hearing impairment:** These learners cannot hear completely or can only hear only when one shouts.

(c) **Physical impairment (wheel chair users, crutch users):** These are learners who are unable to move around the school. They may have difficulties getting to school; may not easily participate in games with other children and may not access school infrastructure such as playgrounds, toilets, classrooms and classroom furniture.

(d) Intellectual impairment (slow learners, autism and dyslexia): These learners may not be able to understand the teacher; may not be able to socialise with other children; may not be able to access the curriculum easily and may need more time to accomplish class work.

(e) Gifted and talented learners: These learners have higher abstract thinking. They are often bored in class after finishing tasks quickly. They may not achieve their full potential as the teacher doesn't cater for their needs. They may not be understood by the teacher and may have a specific talent or could be gifted in a specific area.

The teacher may use any of the following strategies to cater for the students with special needs during the teaching and learning of Geography.

- Use cooperative learning for instance through group work and discussions.
- Mix students with special needs with the rest so that they may be helped.
- Tape-record portions that students can listen (with earphones) to an oral presentation of the necessary materials.
- Provide written and pictorial directions to those with hearing problems.
- Develop special programs and follow up to keep track of their learning.
- Carry out frequent progress checks to students with special needs.
- Use concrete objects such as models, diagrams and samples to those with hearing problems so as to demonstrate what you are saying by using items you can touch.
- For gifted and talented learners, have them assist other learners or give them activities that are more complex than what the rest do.
- Facing the learner while you speak might help learners with hearing impairment.
- Use large writings on the blackboard and on visual aids.
- Try to understand the specific talents of the learners and develop them.
- Break the task down into small steps or learning objectives. Ensure learners start with what they can do and then move on to a new harder task.
- Give the learners lots of practice and time. This helps to ensure the learners have mastered a skill.

1.10 Cross-cutting issues

The competence-based curriculum reflects the significance of connections between different subject areas, integrating them across years and cycles. Cross-cutting issues are integrated across learning areas appropriately. They are all important for learners to learn about but they are not confined to one subject.

Cross-cutting issues are not stand-alone subjects. They are issues which cut across the entire curriculum. There are eight (8) cross-cutting issues:

- **Peace and values education**: This cross-cutting issue shows how

education can simultaneously cultivate values and attitudes which will encourage individual and social action for building more peaceful families, communities, societies, nations and ultimately a more peaceful world.

- **Genocide studies**: This issue helps learners to comprehend the role of every individual in ensuring that genocide never happens again.
- **Gender education**: This issue teaches learners that the sex of a person is biologically determined, while the gender of a person is learned. Gender is socially constructed, reinforced, maintained and reconstructed over time through social and cultural practices.
- **Inclusive education**: This issue handles learning needs that are to be considered and accommodated when teaching in order to meet the learning expectations of each learner.
- **Comprehensive sexuality education**: This issue equips children, adolescents and young people with the knowledge, skills and values in a culturally and gender sensitive manner to enable them to make responsible choices about their sexual and social relationships. It explains and clarifies feelings, values and attitudes as well as promotes and sustains risk-reducing behaviour.
- **Financial education**: This issue builds a strong foundation for responsible and wise financial management in the learners. It does this by developing good planning and saving habits to prepare the learners for financial responsibilities later in life.
- **Environment, climate change and sustainability**: It is important for the learners to realise that humans enjoy a unique position in nature due to their exceptional ability to influence and mould the environment. Learners should be taught the importance of the environment and how to utilise it in a sustainable manner.
- **Standardisation and culture**: This prepares the learners for future responsibilities as adults to contribute to important issues such as improvements in health, economic growth, industrialisation, trade and general welfare of the country.

Cross-cutting issues appear in Geography as stand-alone units or have been integrated into other units. It is therefore the role of the teacher to include them in his or her teaching. In senior 1, there are no stand-alone cross-cutting issues, instead the Student's Book is written in a way that they are integrated in the content and activities. This curriculum is also aimed at developing the learners' critical thinking minds that will enable them to participate in the development of their country and to face major challenges like environmental degradation and overpopulation.

Topic area: Practical Geography

Sub-topic area: Map reading and photographic interpretation

UNIT
1 Introduction to Geography

Key unit competence: By the end of this unit, the learners should be able to determine the importance of Geography and the relationship with other subjects.

Unit objectives

By the end of this unit, the learner be able to:

1. Define Geography.
2. Identify the main branches of Geography.
3. State the importance of Geography.
4. State different sources of geographical information.
5. Identify the relationships between Geography and other subjects.

Content map

Unit 1	Introduction to Geography
Number of periods	3
Introduction	Ask learners to define Geography as it has been defined by different people.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Geographical documents, maps, globe, atlas, photographs, Internet, local environment, field study equipment, talking and tactile materials like tactile maps, smart talking globes, smart tactile atlases and braille textbooks.

Activities	• Defining Geography. • Identifying physical features. • Discussing relationship between human beings and the environment. • Discussing the branches of Geography. • Discussing the importance of Geography. • Explaining the sources of geographical information. • Discussing the relationship between Geography and other subjects.
Competencies practiced	• Teamwork • Presentation of findings • Interpretation • Communication • Literacy
Language	• Discussion in groups • Class presentations
Vocabulary acquisition	• Terminologies related to the introduction of Geography.
Study skills	• Explain the main branches of Geography and its importance. • Classify different sources of Geographical information. • Examine the relationship between Geography and other subjects.
Revision	Tasks and end of unit revision task in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to determine different branches of Geography. • Ability to explain the importance of studying Geography. • Ability to outline the relationship of Geography with other subjects. • Ability to work in groups.
Learning outcomes	• Know the definition of Geography. • Know the main branches of Geography. • Know the importance of Geography. • Know different sources of geographical information. • Know the relationships between Geography and other subjects.

Additional information for the teacher

The field of Geography is a wide academic field with thousands of researchers working on many sub-disciplines or branches of Geography. There is a branch of Geography for about any subject on earth.

Human Geography

Many branches of geography are found within **human geography.** This is a major branch of Geography that studies people and their interaction with the earth. It also studies their organisation of space on the earth's surface.

Economic Geography

Economic geographers examine the distribution of production and distribution of goods, the distribution of wealth and the spatial structure of economic conditions.

Population Geography

Population geography is often equated with demography. However it is more than just patterns of birth, death and marriage. Population geographers are concerned with the distribution, migration and growth of population in geographic areas.

Teaching steps

- Begin the unit by asking the learners to do Activity 1.1 in the Student's Book individually. They should then discuss the meaning of Geography.
- Tell them the origin of the word Geography and then give them definitions of Geography by different scholars.
- Using Activity 1.2 as a guide, let the learners take a walk around the school and identify some of the physical features in the environment. They should find out how these features are important for their survival then make class presentations.
- Ask them to do Activities 1.3 and 1.4 in the Student's Book
- Ask them to answer the questions on Task 1.1 in the Student's Book as an assignment then revise in their groups.
- Introduce the subtopic on the branches of Geography. Tell the learners the two main branches of Geography. Start with physical geography. Guided by Activity 1.5 in the Student's Book, let the learners visit the school garden and collect things that they think are studied under physical Geography. They should relate them to the activities of the people and make class presentations.
- Teach them about physical geography and lead them in a discussion on the ways of protecting physical features. This should be after carrying out the individual research as required in Activity 1.6.
- Give them Task 1.2 as an assignment. Let them discuss in their groups while you mark their work.
- Take them through human and economic geography and let them visit their community as required in Activity 1.7 in the Student's Book. They should find out how people

utilise resources in the environment for their benefit.

- They should then carry out Activity 1.8 and make class presentations.
- Ask the learners to do Activity 1.9 in the Student's Book.
- Give them Task 1.3 as takeaway assignment.
- They should then read the case study and then answer the questions provided after the case study.
- Let them carry out research on the contribution of geography to the socio-economic development of the country and present their findings in class as required in Activity 1.10.
- Teach them the importance of geography.
- Ask the students to read the case study on the sources of geographical information and then answer the questions that are provided.
- Teach them the different sources of geographical information and show them photographs of these sources of information.
- Ask the learners to do Activity 1.14 in the Student's Book on the relationship between Geography and the different subjects. They should then make class presentations.
- Teach them the relationship between Geography and other subjects.
- Give the learners the End of unit revision task at the end of the unit as an assignment. Collect their books and mark their work. Revise with them in a class discussion.
- The cross-cutting issue in this unit is environment and sustainability. Emphasise the need for protecting the environment.

Answers to Task 1.1

2. – Geography is the study of humans and their surroundings.
   - Geography is the study of the relationships existing between human beings and the environment.
   - Geography is a science that studies and describes the surface of the earth. It describes the physical, biological, political and economic characteristics of the earth. It also describes the complex interrelationships among them.

2. Meaning of terms:
   (a) Geo means "the Earth"
   (b) Graphein or grapho means to "write, draw, or describe."
   (c) Geographia stands for "writing about the Earth."
3. He published a book about the earth and named it geography. According to this Greek scholar, Geography is defined as writing about the planet Earth.

   His book contributed a lot to the understanding of the earth. He is regarded as "the father of

Geography".

4. This is an open question that will have a wide variety of answers. Accept correct answers from the learners.

Answers to Task 1.2

1. (a) Main branches of Geography
   - Physical geography
   - Human and economic geography

   (b) (i) Physical features –These are geographical features that are found on or near the earth's surface. Examples are rocks and soils (geology), drainage (rivers, lakes, swamps and other wetlands), vegetation, weather and climate (climatology), relief (landforms such as mountains, highlands and plains) and the structure of the earth (internal and external parts of the earth).

   (ii) Human activities –These are the things that human beings do. Examples are mining, agriculture, fishing, forestry, trade and commerce, power and energy, pollution, settlement, urbanisation, industrialisation, tourism, conservation and management of natural resources.

2. (a) Accept correct answers from the learners.

3. Importance of physical features;

   (a)
   - They help human beings earn income through the various activities carried out in the physical environment.
   - Physical features such as trees prevent soil erosion and are home to wild animals that attract tourists hence increase foreign exchange.

   (b) Accept correct answers from the learners.

Answers to Activity 1.6

(a) Drainage is the natural or artificial removal of surface and sub-surface water from an area.

(b) Lithology is the general physical characteristics of rocks.

(c) Relief is the difference in elevation between parts of the Earth's surface.

(d) Geomorphology is the study of land forms.

Answers to Activity 1.8

- Planting crops
- Fishing
- Building houses
- Mining

– Accept other correct answers

Answers to End unit assessment

1. (a) Accept correct answers of the definition of Geography from the learners.

   (b) • Physical geography

   • Human and economic geography

2. Rocks and soils (geology), drainage (rivers, lakes, swamps and other wetlands), vegetation, weather and climate (climatology), relief (landforms such as mountains, highlands and plains) and the structure of the earth (internal and external parts of the earth).

3.

Term	Description
Biogeography	This is the study of the animals and plants found on the earth's surface and their relationship with mankind.
Climatology	This is the study that is concerned with climate and all its associated geographical aspects.
Geomorphology	This is the study of landforms – their formation and influence on man's way of living.

4. Textbooks, mass media, maps, atlases, graphs, billboards, libraries, people or population, Internet, physical environment and museums.
   Accept correct explanations from the learners.

5. Mark the essay of the learners basing on the importance of Geography.

Topic area: Practical Geography

Sub-topic area: Map reading and photographic interpretation

UNIT 2

UNIT 2: Element of map

Key unit competence: By the end of this unit, the learners should be able to interpret the essential elements of a map and draw sketch maps.

Unit objectives

By the end of this unit, the learner should be able to:

1. Define a map.
2. Identify the various elements of a good map.
3. Identify and interpret symbols and signs on a map.
4. Draw sketch maps.
5. State indicators of relief on a physical map.
6. Define a map and an aerial photograph.
7. Define an atlas index.

Content map

Unit 2	Elements of a map
Number of periods	5
Introduction	Define a map and identify elements of a good map.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Topographic maps, wall maps, ruler, pencils, colours, tactile and talking teaching materials, geographical documents, internet, atlas and local environment.

Activities	• Defining a map. • Discussing the elements of a good map. • Identifying symbols and signs used on maps. • Drawing sketch maps. • Discussing the indicators of relief. • Explaining the methods of presenting relief on maps. • Discussing maps and aerial photographs. • Identifying differences between maps and aerial photographs. • Discussing atlas index.
Competencies practiced	• Teamwork • Presentation of findings • Interpretation • Communication • Literacy
Language	• Discussion in groups • Class presentations
Vocabulary acquisition	Terminologies related map work and photographic work.
Study skills	• Clarify various elements of a good map. • Locate features on maps using compass directions. • Observe the symbols on a map and interpret them using a key. • Draw a sketch map and apply the elements of a good map. • Interpret the indicators of relief on a physical map and topographic map. • Differentiate a map from an aerial photograph. • Explain the elements of an atlas index.
Revision	Tasks and end of unit revision task in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to correctly interpret the essential elements of a map. • Ability to draw sketch maps correctly. • Ability to work in groups.

Learning outcomes	• Know the definition of a map. • Know the various elements of a good map. • Know and interpret symbols and signs on a map. • Know how to draw sketch maps. • Know the indicators of relief on a physical map. • Know the definition of a map and an aerial photograph. • Know the definition of an atlas index.

Additional information for the teacher

This unit intends to equip the learners with the basic skills in map interpretation. Maps and photographs carry information. It is necessary for the Geography learners to have the skills of extracting such data from the maps presented to them. It is on this basis that, the unit is referred to as elements of a map. This is due to the fact that one has to know the characteristics of a good map. This will enable learners to distinguish maps from aerial photographs. The unit automatically equips the learners with the competence required to further learn map reading in the upper courses.

The Geography teacher therefore, must read the contents of this unit in the Student's Book to see the activities that are used to foster the learning of this unit. This is found in the Student's Book.

Teaching steps

– Introduce the unit by giving the learners the various definitions of a map.

– Ask the learners to read the case study at the beginning of the unit. This will enable them to compare the traditional ways of finding the direction of places and the easiest way of using a map without any difficulties.

– Ask the learners to do Activity 2.1 in the Student's Book. This activity intends to guide the learners towards finding the elements of a good map and their cardinal points on their own. This should be done in groups to build up team spirit and cooperation. Each group should present their answers in class to foster communication.

– Let the learners do Activity 2.2 in the Student's Book. This activity should be carried out in groups. Work closely with each group to make sure that there is individual participation. Design other activities of the same nature to be used for their assignment.

– Using Activity 2.3 as a guide, let the learners use the map to answer the questions that are provided. Use this activity to see whether learners have achieved the lesson objective through measuring their ability to use some of the elements on a map to determine the information needed.

– Guided by Activity 2.4 in the Student's Book, let the learners identify the signs and symbols used to represent various aspects on the map provided. This aims at making the learners able to identify, read and interpret symbols used in map reading. The activity needs participation and oral answers from the learners. However, you can request them to draw the symbols they have identified so that they learn by doing.

– Activity 2.5 requires learners to go outside the classroom under your guidance. Make sure that a time limit is set for example 20 minutes. The learners should draw a map of their school environment and indicate all the elements of a good map. They should also apply

the symbols already learnt in the previous lessons. Mark their work and display the best drawings in class.

– After evaluating Activity 2.5, give the learners the guidelines on how to construct a good sketch map. Teach them how they can distinguish a sketch map from an actual map.

– Give the learners Task 2.1 as an assignment and let them discuss their findings in their groups.

– Ask the learners to carry out Activity 2.7 in the Student's Book. They should identify the physical features and identify those that are man-made. They should then describe the relief of the area.

– Guide the learners in doing Activity 2.8. This activity requires prior preparation in order to be successful. It is more dependent on observation method and identifying the required information. The answers for this activity depend on the nature and relief of a given area. Part (e) and (f) of this aims at putting across environment and sustainability cross-cutting issue. Therefore, make sure that during the presentation in class, much emphasis is put on the two areas.

– The learners will learn about the methods of presenting relief on a map using Activity 2.9 as a guide. The answers for this activity depend on the map extract you will have given the learners. Start with a simpler topographical map, then after seeing learners mastering the map reading skills, use a more complex or detailed map.

– Teach them about the different methods of presenting relief on maps as they take down notes.

– Learners should do Activity 2.11 in their groups and locate the trigonometric stations from the map.

– Learners should identify spot heights that are indicated on the map after they have been taught about spot heights.

– Teach the learners about contours and discuss their characteristics. Tell them how they can interpret contours on topographical maps. They should then do Activity 2.13 in their groups by carrying out research.

– Take them through hills, depressions, depression craters, ridges and escarpments then let them do Activity 2.14 in pairs. They should also do Activity 2.15 under your guidance and discuss in class.

– Teach them about slopes, the types of slopes and how they are represented on a topographical map. Guided by Activity 2.16, let the learners draw the slopes that they have observed and indicate the gradients. They should also do Activity 2.17 in their groups.

– Activity 2.18 requires the learners to use a topographical map extract to describe the nature of the land that has been shown. The learners should identify the landforms on the map.

– Teach the learners about even slopes and let them carry out the respective activities. They should also take down notes during the teaching process.

– Introduce the subtopic on maps and aerial photographs. Let the learners study the images provided in Activity 2.21 and find out the differences between the two images.

– In Activity 2.22 in the Student's Book, the learners are expected to identify maps and photographs from atlases. They should then give reasons that made them come up with the conclusion. Ask them to make class presentations.

– Teach them the differences between maps and aerial photographs and give them notes. They should also carry out Activity 2.23 under your guidance.

– Introduce the subtopic on the atlas index and ask the learners to do Activity 2.24 and make class presentations.

– Provide them with atlases and let them observe the index page in the atlas. Discuss with them their observations in class.

– Take them through the elements of a good atlas index and give them notes.

– Ask the learners to do the End of unit revision task as an assignment. Collect their books and mark their work. Discuss with them in class and pay emphasis to areas where most of them had difficulties.

Answers to Task 2.1

1. A map is a representation of all or part of the earth's surface on a flat surface. Refer to the Student's Book for more information.

2. C – (The title, key and compass direction).

3. Other elements of a good map are; the scale and frame.

4. The differences existing between topographic maps and the sketch maps are;

Sketch maps	Topographic maps
They are simple and hence easy to understand.	They are sometimes complex and require map reading skills.
They are roughly drawn.	They are drawn neatly and accurately.
They are not drawn to scale.	They are drawn to scale.
They represent few features for the interest of the user.	They sometimes represent a variety of information such as; relief features, human and economic features.
They are less detailed as compared to topographical maps.	They are more detailed.

5. Refer to the Student's Book for the steps involved in drawing a sketch map.
6. Refer to the Student's Book for the characteristics of a sketch map.

Answers to End unit assessment

1. (a) Relief is the difference in elevation (or height) between parts of the Earth´s surface. It refers to the highest and lowest points in an area.

   (b) Mountains, hills, rivers, swamps, dams, lakes, plains, escarpments and fault lines.

2. (a) Ways in which relief is represented on a map.
   - Use of colour
   - Trigonometric stations
   - Sport heights
   - Contours
   - Pictorial representation
   - Hachures
   - Shading

   (b) Contours, slopes and use of colour.

3. (a) Trigonometric stations are fixed surveying stations that are used for land surveys while spot heights are dots used to represent specific areas on a topographical map.

   (b) Primary, boundary pillar and secondary trigonometrical station.

   (c) Accept the correct symbols used for each station mentioned.

4. (a) This is one of the commonly used methods of representing relief on topographical maps. These are types of hills that have round tops with slopes that are similar in gradient and appearance.

   (b) Accept the correct illustrations from the learners.

5. (a) Contours are lines drawn on maps joining areas with the same height above sea level.

   (b) Refer to Student's Book

(c) Refer to Student's Book

6. Accept correct explanations and illustrations from the learners.

7. Refer to the Student's Book

8. (a) An atlas index is a detailed alphabetical listing of names, places and topics.

(b) Characteristics of an atlas index.

- The atlas index shows various topics and names of places.
- The index is at the back of the atlas.
- The index lists a summary of the specific contents of the atlas.
- The index acts as a pointer. It directs the reader to specific pages where given topics can be found inside the atlas.
- The index follows a systematic alphabetical or numerical order.

Topic area: Physical Geography

Sub-topic area: Understanding the earth and universe

UNIT 3

The Earth in relation to the universe

Key unit competence: By the end of this unit, the learners should be able to analyse the impact of the Earth's position and movements in the solar system.

Unit objectives

By the end of this unit, the learner must be able to:

1. Identify different components of the universe.
2. Describe the Earth and the solar system.
3. State the Earth's movements and their consequences.
4. Show the relationship between longitude and time.
5. Define latitude and longitude.

Content map

Unit 3	The Earth in relation to the universe
Number of periods	12
Introduction	Engage learners in various activities which require them to go outside and observe their environment. They should and also observe various photographs that they are given and answer the questions that asked. All these are done before learners are given content.
Classroom organisation	Group work; pair work; individual work and whole class orientation.
Equipment required	Geographical documents, illustrations, globe, Internet, torch, diagrams, tactile and talking materials, sketch maps, local environment, photographs and atlas.

Activities	• Discussing components of the universe. • Defining the term universe. • Discussing galaxies and constellations. • Discussing the Earth and the solar system. • Discussing the solar system. • Explaining the moon. • Discussing the characteristics of the Earth. • Discussing the Earth's movements and their consequences. • Explaining the rotation of the Earth on its own axis.
Competencies practised	• Literacy • Map reading • Analysis • Practical activity • Cooperation • ICT • Digital competence • Teamwork • Research • Description • Identification • Explanation • Defining • Examining • Communication • Drawing
Language	• Class presentation • Discussion of research findings • Oral questions and answers • Presenting the geographical findings
Vocabulary acquisition	Terminologies that relate to the earth and the universe.
Numeracy	Determining the time and longitudes of a given place and the speed of the Earth as it spins on its axis.

Study skills	• Distinguish between the various components of the universe. • Establish the relationship between the solar system and the universe. • Classify the components of the Earth in comparison to those of other planets. • Analyse the Earth movements and their consequences. • Determine time or longitudes of different places in relation to the prime meridian (Greenwich meridian). • Distinguish between a latitude and a longitude.
Revision	Tasks and end of unit revision task at the end of the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to distinguish between various components of the universe. • Ability to establish the relationship between the solar system and the universe. • Ability to classify the components of the Earth in comparison to those of other planets. • Ability to analyse the Earth movements and their consequences. • Ability to determine time or longitudes of different places in relation to the prime meridian. • Ability to work in groups.
Learning outcomes	• Know different components of the universe. • Know the Earth and the solar system. • Know the Earth's movements and their consequences. • Know the relationship between longitude and time. • Know the definition of latitude and longitude.

Additional information for the teacher

Characteristics of the Earth

- It is the third planet from the sun.
- It is the only planet known to support life.
- It is 149 million kilometres from the sun.
- It has one moon.
- It takes 365 days and 1/4 day to complete a revolution around the sun.
- It has water that supports life.
- It contains oxygen that is need for breathing.

Note:

The tasks in the book intend to check the learners' level of achievement in the learning situation. Use the Student's Book to get the answers for each part of the task provided.

Teaching steps

– Start this unit by allowing the learners to go outside to observe the sky. The learners will note down what they have observed. Part (4) demands the learners to give a description of the night conditions. This will include one of the following: starry conditions, cloudy conditions, rainy conditions, windy conditions, cold weather conditions etc.

– Let the learners observe the pictures provided in the book in Activity 3.2. They should compare the two pictures and share their findings in class.

– Take them through the definition of the universe and give them notes.

– Using Activity 3.3 as a guide, let the learners research on the meaning of the universe and share their findings with the rest of their class members.

– In Activity 3.4, the learners are supposed to identify other heavenly bodies. The learners should present their work to the rest of class.

– Discuss with them the components of the universe. They should write down notes during the discussion.

– Give the learners Task 3.1 as an assignment and let them discuss it in their groups.

– Ask the learners to do Activity 3.7 in the Student's Book. They should find out the meaning of constellations and galaxies and state the differences between the two photographs that you will give them. They should then make class presentations.

– They should then do Activity 3.8 and 3.9 to test whether they have understood what they have learnt.

– Ask them to do Task 3.2 as an assignment and discuss in their groups.

– Let the learners do Activity 3.10 in the Student's Book. They should then make their class presentations.

– Teach them about the Earth and the solar system. Start with the solar

system.

- They should then do Activities 3.11, 3.12, 3.13, 3.14 and 3.15 and make presentations in class regarding what they have learnt about the solar system.
- Give them Task 3.3 as an assignment and let them discuss it in their groups.
- Teach the learners about the moon. Let them do Activity 3.16 on the phases of the moon. Take them through the different phases of the moon and also do Activity 3.17. Guide them through this activity.
- They should do research on the characteristics of the moon as required in Activity 3.18 and present their findings in class. Take them through the characteristics of the moon as they take down notes.
- Using Activity 3.19 as a guide, let the learners find out about the eclipses. Take them through the different types of eclipses and show them various pictures of the eclipse.
- Teach them the characteristics of the Earth. They should then do Activities 3.21 and 3.22 then present their findings in class.
- Take them through the shape of the Earth after they have done Activity 3.23 under your guidance.
- Introduce the subtopic on the Earth's movements and their consequences. Start with the rotation of the Earth. Ask them to do Activity 3.26.
- Teach them about the rotation of the Earth on its own axis. Start by telling them the definition of rotation as they take down notes.
- They should do all the activities on day and night, that is, Activities 3.27 and 3.28.
- Teach them the time differences between longitudes and let them do Activity 3.28 in the Student's Book.
- Teach them about the time zones and the International Date Line. Take the learners through the deflection of the winds and ocean currents and the revolution of the moon around the Earth.
- Ask them to do Activity 3.30 then teach them about the revolution of the Earth around the sun. Ask them take down notes during the lecture.
- Define for them revolution first then ask them to do the relevant activities under this area and to make presentations in class.
- Ask them to do Task 3.4 as an assignment and revise with them in class.
- Ask them to do Activity 3.32 in pairs then present their findings in class. Take them through longitudes and latitudes and give them notes.
- They should then use Activities 3.33 and 3.34 to determine the difference between latitudes and longitudes and to calculate each of them.
- Ask them to do the End of unit revision task as an assignment. Collect their books and mark their work. Revise with them in a class discussion.

Answers to Task 3.1

1. (a) The term universe refers all space including everything that exists in it. This includes the stars, the galaxies, the planets, matter and energy.

   (b) Components of the universe

   - Stars
   - Clusters
   - Planets
   - Moon
   - Meteors
   - The sun
   - Galaxy
   - Earth
   - Asteroids
   - Comets

2. (a) Accept correct answers from the learners on the phases of the moon.

   (b) A satellite is an object that moves around a larger object.

3. (a) The curved path of a celestial object or spacecraft around a star, planet, or moon, especially a periodic elliptical revolution.

   (b) This is because they reflect light from the sun.

4. It is the only star that gives its own light.

5. (a) A planet is a heavenly body that rotates around a given star.

   (b) The moon is a natural satellite of the Earth. There is only one moon that attends to our planet Earth.

6. (a) Asteroids are small, airless rocky worlds revolving around the sun between Mars and Jupiter. They are too small to be called planets.

   (b) A planetoid is a heavenly body that rotates around a given star.

   (c) Meteors are also known as meteoroids. Meteors or meteorites are fragments of rock and metal that fall to Earth from space.

   (d) Meteorites are also known as meteors.

   (e) Comets are small heavenly bodies which revolve round the sun along very elongated orbits. They are made up of frozen gases, ice and lumps of rocks.

   (f) A shooting star is a small, rapidly moving meteor that burns up on entering the Earth's atmosphere.

Answers to Task 3.2

1. A constellation is a group of stars that forms a pattern in the sky.
2. (a) The brightest constellation is the Southern Cross commonly referred to as a crux.

   (b) The biggest constellation in our solar system is Hydra.
3. The names of specific examples of constellations:
   - The big dipper
   - Andromeda
   - Pegasus
   - Hydra
   - Hercules
4. The term galaxy refers to a group of billions of stars held together by the same gravity.
5. The three Examples of galaxies are:
   - Milky Way galaxy (where our planet Earth is located)
   - Andromeda galaxy
   - Black eye galaxy
   - Comet galaxy

Answers to Task 3.3

1. A planet is a heavenly body which is made up of rocky solids, is oval in shape, is suspended in space, rotates on its own axis and which revolves around the sun.
2. The inner planets are also referred to as the terrestrial planets. They are made up of silicate rock mantles. Their cores are composed of iron. They are the planets that are near the sun. The outer planets are also called Jovian planets.
3. Examples of terrestrial planets
   - Mercury
   - Venus
   - Earth
   - Mars
4. Accept the correct answers from the learners.

Answers to Task 3.4

1. A season is a climatic change that occurs in different zones of the earth.
2. (a) Summer
   (b) Autumn
   (c) Winter
   (d) Spring
3. 21st March and 23rd September.
4. - On 21st June, the sun is overhead at the tropic of Cancer.
   - On 22nd December the sun is overhead at the tropic of Capricon.
5. Equinox refers to the period when days and nights are equal.

Answers to Task 3.5

1. Refer to Student's Book on page 85.
2. (a) An axis is an imaginary line believed to cut across the centre of the Earth.
   (b) The alternate rising and falling of the sea, usually twice in each lunar day at a particular place, due to the attraction of the moon and sun.
3. Standard time is the time recorded by all the countries found in the same geographical region while time zone is a region that observes a uniform standard time.
4. International Date Line refers to an imaginary line of longitude on the Earth's surface.
5. An ocean current is a continuous, directed movement of seawater generated by forces acting upon this mean flow, such as breaking waves, wind, temperature and salinity differences.
6. Rotation is the act or process of turning around a centre or an axis. The Earth is not static. Revolution is the motion of the Earth on its orbit around the sun.
7. (a) The occurence of the four seasons.
   (b) Varying lengths of the day and night.
   (c) Changes in the position of the overhead sun.

   Mark correct explanations.

Answers to end unit assessment

1. (a) The term universe refers all of space including everything that exists in it. This includes the stars, the galaxies, the planets, matter and energy.

   (b) Components of the universe

   - Stars
   - Clusters
   - Planets
   - Moon
   - Meteors
   - The sun
   - Galaxy
   - Earth
   - Asteroids
   - Comets

2. A constellation is a group of stars that forms a pattern in the sky while a galaxy is a big collection of gas, dust and billions of stars held together by gravity.
3. Refer to the Student's Book.
4. Refer to Student's Book.
5. (a) Rotation and revolution.

   (b) Refer to Student's Book.

   (c) Refer to Student's Book.

6. Latitude refers to the angular distance of a place north or south of the Earth's equator. Longitudes are imaginary lines drawn on a map from the North to the South Pole.
7. Refer to Student's Book.

Topic area: Physical geography

Sub-topic area: Understanding the earth and universe

UNIT
4 The structure of the earth

Key unit competence: By the end of this unit the learners should be able to describe the geological structure of the earth.

Unit objectives

By the end of this unit, the learner should be able to:

1. Explain the external components of the earth.
2. Describe the internal structure of the earth.

Content map

Unit 4	The structure of the earth
Number of periods	4
Introduction	Listing the components of the earth.
Classroom organisation	Whole class orientation followed by group work and individual work
Equipment required	Geographical documents, illustrations, photographs, Internet, slide shows, video clips, avocado, globe, local environment, tactile and talking materials.
Activities	• Discussing external components of the earth. • Explaining the external structure of the earth. • Discussing internal structure of the earth.
Competencies practiced	• Teamwork • Presentation of findings • Interpretation • Communication • Literacy

Language	• Discussion in groups • Class presentations
Vocabulary acquisition	Terminologies related to the structure of the earth.
Study skills	• Infer the relationship between physical and biological aspects of the earth. • Explain the internal structure of the earth.
Revision	Tasks and end of unit revision task in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to correctly explain the external components of the earth. • Ability to describe the internal structure of the earth. • Ability to work in groups.
Learning outcomes	• Know the external components of the earth. • Know the internal structure of the earth.

Additional information for the teacher

Guide the learners on the differences existing between the physical features and man-made features.

a) The importance of the things listed above are:

Vegetation

- Modify climate
- Homeland for wildlife
- Provision of biodiversity
- Supports eco-tourism
- Mountains
- Habitat to some wild animals
- Attract tourists
- Creation of beautiful sceneries
- Supports soils
- Supports agriculture
- Supports the growth of vegetation
- Used as a raw material in brick making
- Home to some organisms which are important to man in one way or the other.

Emphasise on the cross-cutting issue of environment and sustainability. This can be through doing the following:

- Use of better methods of farming such as crop rotation, organic farming, intercropping, application of organic manure or artificial fertilisers.
- Agroforestry
- Reforestation
- Setting up national parks, game reserves, sanctuaries etc.
- Afforestation
- Creation of urban green belts or gardens.
- Mass education.
- Introduction of quick maturing plants–trees, shrubs and grass.
- Soil conservation measures such contour ploughing should be emphasised.
- Strict laws against poaching, overgrazing and bush burning etc.

Teaching steps

– Introduce the unit by asking the learners to do Activity 4.1 in the Student's Book. They should study the photograph provided and mention the natural features that they can see in the photograph. They should then discuss their importance and suggest ways of conserving them. They should then make class presentations.

– Ask the learners to list the external components of the earth.

– Take them through the external structure of the earth.

– Using Activity 4.2 as a guide, let the learners go outside the class and observe the components of the earth in their local environment. They should then answer the questions provided in the activity.

– Give them Task 4.1 as an assignment and let them discuss in their groups.

– Introduce the subtopic on the internal structure of the earth by asking the learners to do Activity 4.4 and to discuss their findings in class.

– Teach them the internal structure of

the earth and give them notes on the same.

– They should identify the parts that make up the internal structure of the earth and describe their characteristics. They should then draw well labelled diagrams.

– Ask the learners to do the End of unit revision task as an assignment. Collect their books and mark their work. Revise with them in class.

Answers to Task 4.1

1. This task in the Student's Book. It primarily intends to assess the learning of the learners and whether the objectives pre-set are being achieved. The answers are found in already discussed activities and the content so far covered, for example Activity 4.1 and 4.2.

2. The composition of the external structure of the Earth:
   - Biosphere
   - Atmosphere
   - Hydrosphere
   - Lithosphere

3 You should be aware that some learners are likely to generalise their answers.However, the expected answers include:
   - Modify climate
   - Support human activities such as agriculture
   - Provision of natural resources
   - Support life for both animals and plants
   - The external components of the earth make it different and unique from other plants.

Answers to End unit assessment

1. (a) Components of the external structure of the earth.
   - The atmosphere
   - The hydrosphere
   - The lithosphere
   - The biosphere
   - The mantle
   - The core

   (b) Refer to the Student's Book.

2. Accept correct diagrams drawn by the learners.

3. The inner core of the earth is under very high pressure and temperatures and that is why it is in a solid state.

4. (i) Sial – Silica and aluminium minerals.
   (ii) Sima – Iron and magnesium minerals.

5. Mohorovicic discontinuity is also referred to as the Moho discontinuity. This is a zone of sharp change in rock density between the crust and the mantle. The mantle is separated from the core by a zone of discontinuity. This zone is referred to as the Gutenberg discontinuity. It occurs at a depth of 2900 kilometres beneath the surface. It was discovered in 1913 by a scientist called Gutenberg.

Topic area: Physical geography

Sub-topic area: Relief

UNIT

5 Forms of relief

Key unit competence: By the end of this unit, the learners should be able to determine the relationship between relief and human activities.

Unit objectives

In this unit, the learner should be able to:

1. Define relief.
2. Identify the different forms of relief.
3. State the relationship between relief and human activities.

Content map

Unit 5	Forms of relief
Number of periods	6
Introduction	Asking learners to describe the appearance of the landscape and name the relief features.
Classroom organisation	Whole class orientation followed by group work and individual work
Equipment required	Pictures, Internet access, maps, paper and pens.
Activities	• Discussing about relief. • Describing the relief of an area. • Interpreting topographic maps. • Naming landforms. • Identifying characteristics of landforms. • Discussing the importance of relief features. • Explaining the relationship between relief features and human activities.

Competencies practiced	• Teamwork • Presentation of findings • Interpretation • Communication • Literacy
Language	• Discussion in groups • Class presentations
Vocabulary acquisition	Terminologies related to relief
Study skills	• Classifying the different forms of relief. • Explaining the relationship between relief and human activities.
Revision	Tasks and end of unit revision task in the book.
Assessment	• Ability to work in groups and to communicate ideas with others. • Ability to observe and interpret maps correctly. • Ability to identify physical features from their physical environment.
Learning outcomes	• To define relief. • To identify main forms of relief. • To locate main relief features on the map of Rwanda. • To know the relationship between relief and human activities.

Teaching steps

- Introduce the unit on the forms of relief. Take the learners outside the classroom. Ask them to observe their environment. They should be able to describe the appearance of the landscape. They should then name the physical features that they see and make notes. Listen as each group makes their presentation.
- Define the term relief. Ask learners to write it down in their exercise books.
- Explain to the learners that the relief features on the earth's surface are formed by various processes such as denudation, weathering, erosion and tectonic forces operating in the earth's crust.
- Discuss with the learners on the notion of the slope. Explain to them the four main types of slopes. The learners should observe the pictures in the book on the different types of slopes.
- Guide the learners in defining altitude and contours. Explain each of them briefly. Engage the learners in giving examples of relief features that are shown by use of contours.
- Using Activity 5.3 on page 101 of the Student's Book as a guide, the learners should study the topographic map provided and interpret it. The findings should be presented in class.
- Briefly tell learners that there are two main types of relief namely, continental and marine relief features.
- Discuss with the learners about the continental relief features. Explain to them the main forms of continental relief. Give them notes. Use appropriate pictures during the discussion.
- Learners to do Activity 5.4 in the Student's Book. They should describe the characteristics of continental relief features and give examples of those features that are found in Rwanda and other countries.
- They should also discuss the importance of the relief features they have identified. Ask them to present their findings in class.
- Discuss with them the second category of forms of relief – marine relief features. Discuss the main relief features of the ocean bed. Use photographs and pictures in the books during the discussion.
- Ask the learners to do Task 5.1 in of the Student's Book as an assignment. Revise with them in class.
- Take the learners on a field visit as required in Activity 5.5. They should find out the influence of relief features on human activities.
- Introduce the subtopic of relationship between relief and human activities. Explain to the learners the effects of relief on human activities. Talk about the effects of relief on transport, settlement, agriculture and other human activities. Guide learners in describing the influence of relief on human activities in Rwanda.

– Ask them to carry out Activity 5.6 on the effects of relief on agriculture. They should also do Activity 5.7. They should discuss their findings in class and write down summaries of what they have discussed.

– Ask the learners to do the end of unit task as an assignment. Collect their books and mark their work. Revise with them in class.

Answers to Task 5.1

1. (a) Continental relief features are landforms that are found on the earth's surface.

   (b) Internal forces of the earth and external agents.

   (c) Mountains, hills, plateaus, ridges, plains and valleys. Accept any three correct answers from the learners.

2. (a) These are landforms that are found on the oceanic crust. The oceanic crust is bordered by the coast.

   (b) continental shelf, continental slope, oceanic ridge, oceanic trench, deep sea plain and oceanic island. Accept any correct answers from the learners.

Answers to End unit assessment

1. (a) Relief refers to the nature of the land surface of the earth. It comprises a wide variety of landforms.

   (b) They are continental and marine relief features.

2. Mountains, hills, plateaus, ridges, plains and valleys.

3. A slope is the rise or fall of a relief feature. It is a measure of the degree of inclination of a feature in relation to the horizontal plane.

   – Altitude is the height or elevation of a point above a given reference point. In Geography the reference level is the sea level.

   – A contour is a line connecting points of the same altitude on a topographic map.

4. Accept correct explanations from the learners on the importance of relief features.

5. The relief features in Rwanda determine the human activities carried out in a place. The main activities that are influenced by relief features include, transport, agriculture and settlements.

6. Ways in which the Rwandan people can protect the relief features in the country.

   - *Planting trees* – There are forests found in the mountains. People should avoid deforestation. They should also practise reforestation in areas where trees have been cut.
   - *Avoid overgrazing* – Large numbers of animals should not be grazed on a small area of the plateau. This will lead to soil erosion which causes land degradation.
   - *Practising appropriate farming methods* – Ploughing should be done across the slope in hilly areas.

Terracing should be done to reduce the speed of runoff hence controlling soil erosion.

- *Growing vegetation cover* – Ground cover vegetation such as grass should be grown on relief features in Rwanda to reduce the rate of erosion. This helps to reduce land degradation.

Diagnostic questions

1. Outline the internal forces of the earth that lead to formation of relief features.
2. (a) What is a contour?

   (b) Explain how contours are used to show relief.
3. Discuss how relief affects human settlement in Rwanda.

Answers to diagnostic questions

1. These forces include tectonic plate movements, earthquakes and vulcanicity.
2. (a) A contour is a line connecting points of the same altitude on a topographic map.

   (b) Contours show the type of relief on the earth's surface. A landscape that is nearly flat is shown by contours that are far apart. On the other hand, contours that are close together show a steep slope.
3. The type of relief in an area influences the distribution of settlements in the following ways in Rwanda.
   - Gently sloping areas are suitable for agriculture. This is due to the deep soils hence attracting settlements. The landscape is also suitable for the construction of houses.
   - The steep slopes have few settlements. This is because it is difficult to construct houses. The soils on such slopes are thin and thus discourage farming.
   - Very flat areas that are covered by marshes and swamps have no settlements. This is because they are unsuitable for the construction of houses. They are prone to flooding and disease causing insects such as mosquitoes.
   - As much as 80% of the world's population lives in the plains.

Topic area: Physical geography

Sub-topic area: Rocks, weathering and soils

UNIT
6 Rocks

Key unit competence: By the end of this unit, the learners should be able to differentiate among types of rocks and their economic uses.

Unit objectives

In this unit, the learner should be able to:

1. Define the term rocks.
2. State the types of rocks.
3. State the characteristics of rocks.
4. Outline the importance of rocks.

Content map

Unit 6	Rocks
Number of periods	5
Introduction	Talking to the learners about rocks. Ask them to define rocks.
Classroom organisation	Whole class orientation and working in groups.
Equipment required	Papers and pens, photographs, journals, geographical sources, textbooks, Internet access.
Activities	• Collecting rock samples. • Observing the rocks. • Describing rocks. • Interpreting photographs. • Identifying characteristics of rocks. • Identifying different types of rocks. • Stating the importance of rocks. • Group discussions.

Competencies practiced	• Teamwork • Literacy • Presentation of findings • Communication • Application of knowledge
Language	• Discussion in groups • Class presentations
Vocabulary acquisition	Terminologies related to rocks.
Study skills	• Taking notes. • Organisation of ideas for presentation.
Revision	Tasks and end of unit revision task in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to identify characteristics of different rocks. • Ability to describe the importance of rocks.
Learning outcomes	• Define rocks. • Understand different types of rocks. • Know the characteristics of rocks. • Understand the importance of rocks.

Additional information for the teacher

The minerals in a rock may or may not have been formed at the same time. What matters is that natural processes glued them all together.

Extremely common in the earth's crust are igneous rocks that are volcanic and form from molten material. They include not only lava spewed from volcanoes, but also rocks like granite, which are formed by magma that solidifies far underground.

Typically, granite makes up large parts of all the continents. The seafloor is formed of a dark lava called basalt, the most common volcanic rock.

Granite rocks can be very old. Some granite, in Australia, is believed to be more than four billion years old, although when rocks get that old, they've been altered enough by geological forces that it's hard to classify them.

Teaching steps

- Introduce the unit by asking the learners to do Activity 6.1. Guide them through this activity.
- Give them the definition of rocks which they should write in their books. Explain to the learners that minerals aggregate together to form rocks.
- Ask the learners to do Activity 6.2 in the Student's Book on the types and characteristics of rocks.
- Let the learners do Activity 6.3. Guide the learners by explaining igneous rocks. Clearly distinguish between intrusive and extrusive igneous rocks. Conclude by giving examples. Show them pictures of the different rocks. Give them notes.
- Using Activity 6.4 as a guide, let the learners discuss sedimentary rocks. Guide the learners by explaining sedimentary rocks. Clearly describe how sedimentary rocks are formed and give examples. Use pictures to show them different types of sedimentary rocks. Let them take down notes.
- Let the learners carry out research on metamorphic rocks as suggested in Activity 6.5 in the Student's Book. Guide the learners by explaining metamorphic rocks. Describe the ways through which metamorphic rocks are formed and give examples. Ask them to observe the pictures of metamorphic rocks in the Student's Book. Give them notes.
- Give the learners Activity 6.7 as an assignment. They should present their findings in class.
- Teach them the different characteristics of rocks and let them take down notes.
- Let the learners read the case study in the Student's Book. They should then answer the questions that follow. Discuss with them the characteristics of rocks as they take down notes.
- Take them to a field visit as guided by Activity 6.8. Guide them through the activity. Let them discuss their findings when they are back in class.

– Ask the learners to do the questions at the end of the unit as an assignment. They should revise them in their groups.

Answer to Task 6.1

Refer to the Student's Book.

Answers to End unit assessment

1. A rock is a naturally occurring solid made up of one or more minerals.
Rocks form the solid part of the Earth's crust.

2. (a) Characteristics of igneous rocks.

- Igneous rocks are formed from the cooling and solidification of magma or lava.
- There are acidic, basic, intermediate and ultra-basic igneous rocks.

(b) Diorite, granite, gabbro, syenite and peridotite.

(c) Extrusive igneous rocks form from lava that cools and solidifies on the Earth's surface. The lava cools and solidifies rapidly leading to the formation of small crystals.

3. Formation of sedimentary rocks.

- Sedimentary rocks are formed by the deposition of materials at the earth's surface and within water bodies.
- They are formed through the process of sedimentation.
- The sediments that form sedimentary rocks are derived from the pre-existing rocks through weathering and erosion.
- Sedimentary rocks are formed when sediments of other rocks are laid down in layers on land or in the sea.
- The sediments are transported and are deposited in layers by wind, water or moving ice.
- After a long period of time, the sediments are compacted to become hard rocks. This is due to pressure from the overlying sediments and other materials.

4. (a) Refer to Student's Book.

(b) Accept the correct characteristics of sedimentary rocks given by the learners.

5. (a) Metamorphic rocks are formed when pre-existing rocks are subjected to great heat or pressure. Sometimes the rocks are subjected to both heat and pressure.

(b) Refer to the Student's Book.

(c) Limestone, chalk, coral reef coral, lignite coal, bituminous coal, brown coal, anthracite coal.

6. Refer to Student's Book.

Topic area: Physical geography

Sub-topic area: Weathering and soils

UNIT
7 Soils

Key unit competence: By the end of this unit, the learners should be able to determine the relationship between different types of soils and human activities.

Unit objectives

In this unit, the learner should be able to;

1. Define soil.
2. State factors responsible for soil formation.
3. State the processes of soil formation.
4. Identify soil properties and characteristics.
5. Describe soil profile and soil catena.
6. Identify the types of soils.
7. State the importance of soils.
8. Outline the effects of soils on human activities.

Content map

Unit 7	Soils
Number of periods	10
Introduction	Talk to the learners briefly about soil. Ask them to give their understanding of soil.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Photographs, shovel, a clear jar or bottle, water, soil, funnel, Internet access, papers and pens and polythene bags.

Activities	• Digging the soil. • Collecting soil samples. • Conducting simple experiments on soil. • Observing the soil. • Identifying the characteristics of soil. • Drawing diagrams for example on soil profile and soil catena. • Outlining the importance of soils. • Outlining the effects of soil on human activities. • Group discussion.
Competencies practiced	• Teamwork • Communication • Interpreting information • Literacy • Application of knowledge
Language	• Discussion in groups • Presentation of findings
Vocabulary acquisition	Terminologies related to soils.
Study skills	• Examine the characteristics of different soil types and soil formation processes. • Analyse the factors influencing soil formation. • Carry out research in the local environment to describe the soil profile and soil catena. • Classify different types of soils. • Apply knowledge to suggest the use of certain types of soils. • Explain the relationship between different soil types and human activities.
Revision	Tasks and end of unit revision task in the Student's Book.

Assessment	• Ability to work in groups and present the findings. • Ability to examine different characteristics of different soil types and soil formation processes. • Ability to describe the soil profile and catena. • Ability to classify different soils. • Ability to explain the importance of soil. • Ability to describe the relationship between different soil types and human activities.
Learning outcomes	• Define soil. • Understand the components of soils. • Understand processes of soil formation. • Understand the soil properties. • Draw labelled diagrams of soil profile and soil catena. • Classify soils. • Outline the importance of soils. • Teamwork.

Additional information for the teacher

Soil is a mixture of minerals, organic matter, gases, liquids, and the countless organisms that together support life on earth. Soil is a natural body known as the pedosphere and which performs four important functions. These are:

- It is a medium for plant growth.
- It is a means of water storage, supply and purification.
- It is a modifier of the atmosphere of the earth.
- It is a habitat for organisms.

As soil formation is an extremely slow process, soil can be considered essentially as a non renewable resource.

The rate of soil degradation is on the rise. This is caused by erosion, loss of organic matter content, compaction, salinisation, contamination and landslides. These impacts affect human beings and other living things on earth negatively.

The problem of soil degradation needs to be dealt with immediately to ensure soil fertility. This will lead to good health among human beings and other living organisms.

Teaching steps

– Introduce the unit by reminding the learners what you taught them in the previous lesson. Introduce the topic on soil.

– Ask the learners to do Activity 7.1 in the Student's Book. They should collect and observe soil samples then describe what they have seen. Let them also find out the definition of soil.

– Give the learners the definition of soil. They should write it down in their books. Take them through the soil formation processes.

– Explain to the learners that soil formation takes a long time through the processes of weathering of rocks, leaching and decomposition of organic matter.

– They should do the Activity in the Student's Book in pairs. Teach them about the weathering process of soil formation.

– Discuss with them about leaching which is a process of soil formation and finally take them through salinisation.

– Ask the learners to do Task 7.1 in the Student's Book as an assignment. They should then revise it in their groups.

– Discuss with the learners the factors that influence soil formation. Use different pictures while discussing this.

– Give the learners the Task 7.2 in the Student's Book as an assignment. Ask them to revise it in pairs.

– Help the learners carry out Activity 7.5. Provide them with the necessary items needed in doing the activity. They should then answer the questions that follow.

– Lecture them on the constituents of soil. Give them notes on the same. Ask them to do Task 7.3 in the Student's Book as an assignment.

– Ask the learners to do Activity 7.6

in their groups and present their findings in class.

– Take them through the properties of soil. Begin with the physical properties of soil. Ask the learners to carry out Activity 7.7. They should present their findings in class.
– Begin with soil texture. Teach them about the soil texture. They should do Activity 7.8 to find out the texture of soil. Each group should present their findings in class. Give them notes.
– Take them through the property of soil structure. Tell them what soil structure is and explain to them the different types of soil structure. Guide the learners in carrying out Activity 7.9 and discuss the findings in class. Give them notes.
– Take the learners through the next physical property of soil which is soil colour. Ask the Learners to do Activity 7.10 under your guidance. Give them notes.
– Guide the learners through Activity 7.11. Discuss with them soil depth. Give them notes.
– Teach them about soil density and soil porosity. Using Activity 7.12 as a guide, let the learners calculate the porosity of the soil samples that they have collected. Give them notes.
– Ask the learners to carry out Activity 7.13 and then discuss with them soil permeability. Give them notes.
– Teach them about soil consistency and let them carry out the respective activities to determine the consistency of different soils. Give them notes.
– Lecture the learners on the chemical properties of soil. Ask them to identify some of the chemical properties of soil. Help the learners in conducting the experiment to find out soil pH as required in Activity 7.17 in the Student's Book. Teach them about soil pH and give them notes.
– Ask the learners to carry out Activity 7.18. Provide them with the materials and equipment needed. Take them through the chemical property on soil salinity and give them notes.
– Let them find out about cation exchange capacity as required in Activity 7.20 and 7.21 in the Student's Book respectively. Discuss this with them in class and give them notes.
– Previously, you briefly mentioned something on soil structure. Ask the learners to tell you what soil structure is and identify the types of soil structure. Teach them about the different types of soil structures and give them notes. Show them pictures of the different types of soil structures. Also teach them about the impacts of improving soil structure. Give them notes.
– Ask the learners to do Activity 7.23 as an assignment. Discuss with them in the next lesson. Teach them about soil profile and let them observe Figure 7.15 in the Student's Book on soil profile. Explain to them the major horizons of the soil profile.

– They should carry out Activity 7.24 to observe the different horizons of the soil profile.
– The learners should do Activity 7.25 to find out the meaning of soil catena. Discuss with them in class what soil catena is. Observe the picture in the Student's Book on soil catena. Give the learners notes and let them also carry out Activity 7.26 and present their findings in class.
– Guided by Activity 7.27, let the learners dig up soil from different areas of the school compound and classify the soil. The findings should be presented in class. Discuss with them the different types of soils. They should then do Activity 7.28 in the Student's Book.
– Ask the learners to discuss the importance of soils in groups and to write down their findings guided by Activity 7.29. Group leaders should make presentations in class and give a summary of their presentations by explaining the importance of soils. Give relevant examples on the uses of soils. They should do Activity 7.30 individually as an assignment. They should then present their findings in class in the next lesson.
– Engage learners in a discussion on the effects of soil on human activities and write down the findings. Group leaders should make presentations to the class. Summarise by explaining to the learners the effects of soil types on human activities.

Answers to Task 7.1

1. This is the process by which water removes minerals and other soluble constituents from the soil. The minerals are usually removed from the upper to the lower horizons of soil.
2. Conditions that make it possible for leaching to occur.
    - High temperatures
    - Low rainfall
    - Sloping land
3. Effects of leaching in soil.
    - *Eluviation* – This is the process by which soluble minerals are carried down the soil structure. These minerals are first dissolved by rainwater. They are then carried from the upper to the lower horizon of the soil. The top layer becomes deficient of some minerals especially the *bases*. This process leads to the formation of new soils.
    - *Illuviation* – When eluviation occurs, soluble minerals are leached from the upper soil to a lower layer. These leached materials are also leached into lower layers by a process known as illuviation. The leaching process at each layer forms new soils.
    - *Salinisation* – This process occurs in areas with high temperatures and low rainfall such as the deserts. It is a

process by which water soluble salts accumulate in the soil. This accumulation is caused by high rates of evaporation on the earth's surface. The salts in the lower horizons are carried upwards towards the surface by capillary action.

- *Podzolisation* – This process occurs in the cool temperate regions. Slow decomposition of vegetative matter results in the formation of humic acids. Minerals like calcium, iron, magnesium, aluminium, salts, bases and carbonates are dissolved and moved from one horizon to another. This leads to the formation of high acidic soils which are ash grey in colour.
- *Calcification* – This process occurs in dry climates. Calcium carbonate is dissolved in horizon A during the periods of rainfall or snowmelt. The dissolved calcium carbonate is then carried downwards to horizon B where it is deposited.
- *Laterisation* – This process occurs in warm humid climates. During the wet season, mineral salts in horizon A dissolve in rain water. The minerals that dissolve are mainly silica and the bases. The dissolved minerals percolate downwards to the lower layer (horizon B). Insoluble minerals such as iron and aluminium accumulate in the top layer. They form a crust of laterite. The top layer is reddish in colour.
- *Decomposing organic matter* – When plants and animals die, their remains decompose in the soil. This decomposition is aided by the micro-organisms that are found within the soils. The decomposed organic matter form humus. The humus mixes with the soils to form fertile layers of soil.

Answers to Task 7.2

1. (a) Parent rock refers to the original material that forms the rock that weathers into soils.
   (b) Climate refers to the weather conditions prevailing in an area in general or over a long period.
   (c) Topography is a detailed description or representation on a map of the natural and artificial features of an area.
   (d) Living organisms are a form of life composed of mutually interdependent parts that maintain various vital processes.
2. How the above mentioned influence soil formation.
   - *Parent rock* – The parent rock determines the chemical and physical characteristics of the soil. The nature of the parent rock influences the rate of weathering. Soft rocks are weathered faster thus enhancing the soil formation process. Hard rocks on the other hand are weathered slowly. This slows down the soil formation

process.

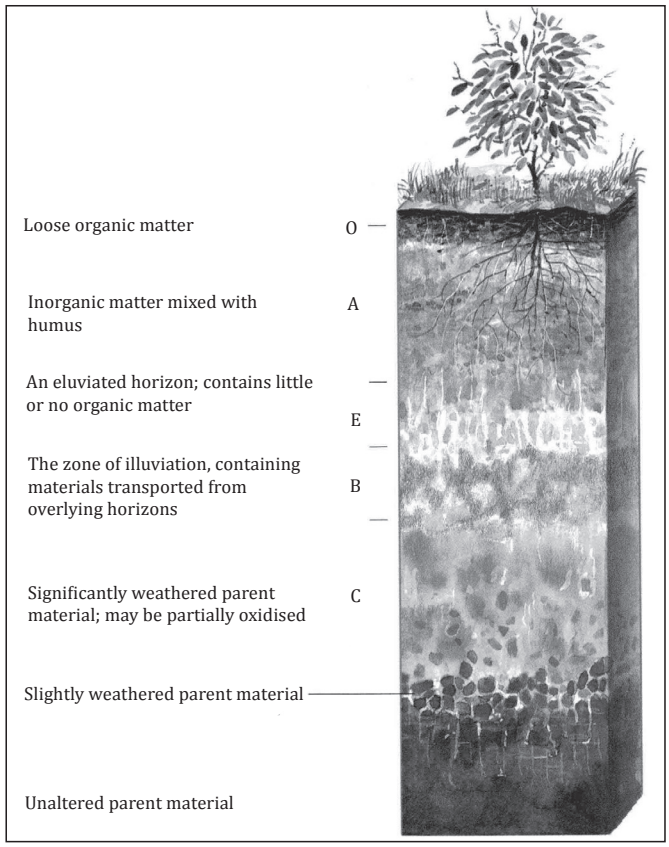
- *Climate* – The climate of an area determines the way in which weathering of the rocks takes place. The main elements of weather that influence soil formation are temperature and rainfall. Rainfall provides water. This water makes it possible for decay and disintegration of rocks that form soil. Rainfall also affects the rate at which soil forming processes such as leaching occurs. Seasonal variations in rainfall can cause accumulation of salts in the soils. This leads to the formation of saline soils. High temperatures increase the rate of weathering of the parent rock to form soils. They also accelerate the rate of bacterial activities which generate humus. Rain water, wind and glaciers erode, transport and deposit soil particles in lowland areas. This forms new soils such as alluvial soils and loess.
- *Topography or relief* – The topography of an area influences the process of soil formation in many ways. The most important being the slope of land. Steep slopes encourage the swift flow of water and hinder the process of soil formation. There is usually soil erosion in areas of steep slopes leading to thin soils. The areas of low relief or gentle slope experience deposition and have deep, well drained soils. The degree of slope also largely determines the fertility of soil. Flat areas are highly saturated leading to the development of water logged soils. Valley bottoms encourage the formation of deep fertile soils due to deposition. Soils on the hill tops are heavily leached due to high rainfall. Slopes which are more exposed to the sun or rain experience weathering of the parent rock to form soils.
- *Living organisms* – When plants and animals die, they decay to form humus. Micro-organisms in the soil aid in plant and animal decomposition to form humus. These organisms include bacteria, fungi, vegetation and animals. Their major influence is the effect on the chemical and physical environment of the soils. Roots of plants penetrate into the rocks facilitating weathering of the parent rocks. This process forms soils. Human activities like ploughing and harrowing breakup the rocks into small particles to form soil.

Answers to Task 7.3

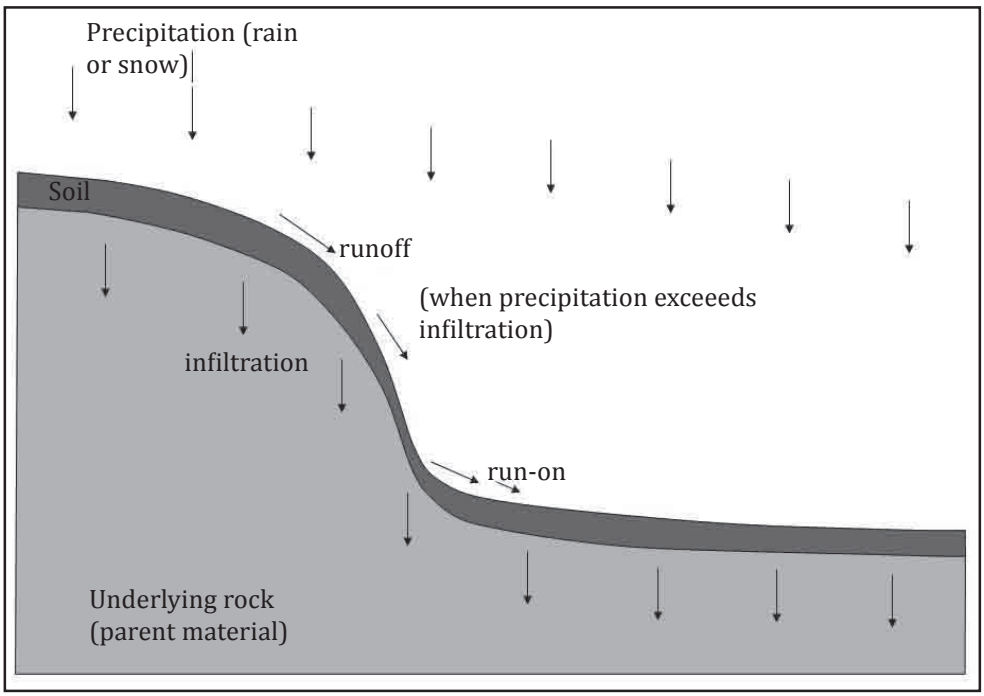
1. Components of soil;
   - Inorganic particles
   - Organic matter
   - Water (moisture)
   - Air (gases)
2. Importance of humus to the soil
   - It enhances the soil's ability to hold and store water.
   - It provides essential minerals to the soil.
   - It improves the soil structure.
   - It reduces eluviation of soluble minerals from the top soil.
   - It helps in soil aeration.
3. Significance of moisture in the soil.
   - It dissolves various substances for example salts that are derived from plant or animal remains forming solutions.
   - It helps plants to absorb minerals from the soil.
   - It washes away highly soluble minerals from the upper to the lower layers (leaching).
   - It brings soluble minerals from the lower to the upper horizons of soil through capillarity.

Answers to Task 7.4

(a) Soil profile diagram



(b) Soil catena



Answers to End unit assessment

1. Soil refers to the top layer of the earth's surface on which plants grow.

2. Factors that influence soil formation;
   - Weathering of rocks
   - Leaching
   - Salinisation

3. (a) Components of soil;
   - Inorganic particles
   - Organic matter
   - Water (moisture)
   - Air (gases)

   (b) Refer to the Student's Book.

4. (a) This is the vertical arrangement of the soil in layers from the surface to the bedrock. The layers of soil are called horizons.

   (b) Accept the correct drawing from the learners as shown in the Student's Book.

   (c) Refer to the Student's Book.

5. (a) Soil catena refers to the sequence of different soil profiles that occur down a slope.

   (b) Soil catena is influenced by relief, drainage, leaching and transportation of soils during erosion.

   (c) Accept the correct answers from the learners.

6. Accept correct answers from the learners. Refer to the Student's Book .

Topic area: Practical Geography

Sub-topic area: Weather and climate

UNIT
8 Weather and climate

Key unit competence: By the end of this unit, the learners should be able to recognise the importance of the atmosphere, differentiate weather and climate and classify the major climatic types.

Unit objectives

By the end of this unit, a learner should be able to:

1. State the difference between weather and climate.
2. Identify layers of the atmosphere and state the importance of the atmosphere.
3. Outline the elements of weather and climate.
4. Identify weather instruments at a weather station.
5. State the factors influencing temperature variation.
6. Identify how to measure temperature.
7. State the major processes the water cycle.
8. Identify different types of precipitation.
9. State the different types or forms of rainfall.
10. Explain the factors influencing atmospheric pressure variation.
11. Identify the factors influencing humidity and how to measure humidity.
12. Identify different types of winds.
13. State different types of clouds.
14. Define sunshine.
15. Outline factors influencing climate.
16. Locate the major climatic zones of the world.

Content map

Number of periods	23 lessons
Introduction	The unit is introduced by use of various activities and research work all aiming at introducing the concept of weather and climate in the minds of the learners.
Classroom organisation	All learners will be involved in the learning activities regardless of their abilities and differences. Some of the lessons are designed to be conducted from outside the class while others in the classroom.
Equipment required	Saucepan, photographs, thermometers, charcoal and charcoal stove, Internet, geographical documents, pieces of sticks, pieces of paper and glue.
Activities	43 activities composed of tasks, activities and practical work based on the fieldwork and revision work.
Competencies practised	Literacy; map reading, and analysis; cooperation; ICT and digital competence; teamwork; research, description, identification, explanation, defining, examining, communication and drawing.
Language	• Class presentations and discussions of research findings • Written assignments
Vocabulary acquisition	At the end of the unit in the Student's Book, there is a list of new words.
Numeracy	Measuring temperature, rainfall and determining humidity using the hygrometer.
Study skills	Listening; speaking; reading; writing, researching, discussing, research projects, drawing, differentiating, interpreting.
Revision	• Exercises given for formative assessments on weather and climate. • Activities are designed in a way that they reflect application of skills and knowledge. • Revision tool such as drawing can also assist in internalising the concepts under concern etc.
Assessment	Exercises and revision tasks are given at the end of the unit and in the course of the lesson to facilitate both formative and summative assessments.

Learning outcomes	• State the difference between weather and climate. • Identify layers of the atmosphere and state the importance of the atmosphere. • Outline the elements of weather and climate. • Identify weather instruments at a weather station. • State the factors influencing temperature variation. • Identify how to measure temperature. • State the major processes of the water cycle. • Identify different types of precipitation. • State different types/forms of rainfall. • Explain the factors influencing atmospheric pressure variation. • Identify the factors influencing humidity and how to measure humidity. • Identify different types of winds. • State different types of clouds. • Define sunshine. • Outline factors influencing climate. • Locate the major climatic zones of the world.

Additional information for the teacher

Weather describes the condition of the atmosphere over a short period of time. For instance, from day to day or week to week, while climate describes average conditions over a longer period of time. Humidity, air temperature and pressure, wind speed and direction, cloud cover and type, and the amount and form of precipitation are all atmospheric characteristics of weather.

The sun is ultimately responsible for the weather. Its rays are absorbed differently by land and water surfaces (equal amounts of solar radiation heat the ground more quickly than they do water). Differential warming, in turn, causes variations in the temperature and pressure of overlying air masses.

Climate is what you expect while weather is what you get. In other words, you can expect rain in Rwanda in April, but you may or may not get it on a particular day.

The climate of an area or country is known through the average weather over a long period of time. If an area has more dry days throughout the year than wet days, it would be described as a dry climate; a place which has more cold days than hot days would make it known to have a cold climate.

Teaching steps

- This unit starts with activities as a methodology that fosters the learner-centred teaching/learning techniques that put the learners at the centre of their own learning. Ask the learners to do Activity 8.1 in the Student's Book.
- Define the atmosphere, weather and climate.
- Ask the learners to do Activity 8.2 in the Student's Book. Define weather while making reference to the Student's Book.
- Ask the learners to do Activity 8.3 in the Student's Book. Define climate while referring to the text in the Student's Book.
- Guide the learners to do Activity 8.4 in the Student's Book. Discuss the structure of the atmosphere. This part discusses the layers of the atmosphere and their characteristics. Discuss the troposphere, stratosphere, mesosphere, thermosphere and exosphere.
- Ask the learners to do Activities 8.5 and 8.6 in of the Student's Book, respectively.
- Discuss the composition of the atmosphere. Refer to the text in the Student's Book.
- Discuss the importance of the atmosphere. Give the learners Activity 8.7 in the Student's Book as a takeaway assignment.
- Discuss the elements of weather and climate. Begin by asking the learners to do Activities 8.8 and 8.9 in the Student's Book.
- Refer to the text in the Student's Book. Ask the learners to do Activity 8.10 as a takeaway assignment.
- Ask the learners to individually answer the questions in Task 8.1 in the Student's Book. Mark the work and schedule for a revision class to correct the learners where they

might not have answered correctly.

- Introduce the weather station and its instruments. Discuss the instruments by referring to the Student's Book.
- Guide the learners in doing Activity 8.11 in the Student's Book. Allow them time to do it and to present their findings in a class presentation.
- Guide the learners in doing Activity 8.12 in the Student's. This is a field study activity.
- Ensure the learners benefit from the visit as much as possible.
- Discuss the importance of a weather station in a school.
- Ask each learner to individually answer the questions in Task 8.2 in the Student's Book. Mark the work and schedule for a revision session with them to correct them where they might not get the answers correct.
- Discuss temperature as an element of weather. Begin by asking the learners to do Activity 8.14 in the Student's Book. Discuss the maximum and minimum thermometers as instruments of measuring temperature and how they work. Refer to the text in the Student's Book.
- Discuss the factors influencing variation of temperature. Refer to the Student's Book.
- Give the learners Activity 8.15 as a takeaway assignment.
- Study the formulas used in calculating the temperature of given areas. Refer to the Student's Book.
- Give the learners Activity 8.16 the Student's Book as a takeaway assignment.
- Discuss precipitation. Begin by asking the learners to do Activity 8.17 in the Student's Book.
- Discuss the forms of precipitation by referring to the text in the Student's Book.
- Give the learners Activity 8.18 as a takeaway assignment.
- Ask the learners to individually answer the questions in Task 8.3 in the Student's Book.
- Give the learners to do Activity 8.20 as a takeaway assignment.
- Discuss the types of rainfall as discussed in the Student's Book.
- Ask the learners to do Activity 8.21 in the Student's Book.
- Explain the measurement of rainfall by making reference to the text in the Student's Book.
- Ask the learners to do Activity 8.22 in the Student's Book as a takeaway assignment.
- Ask the learners to answer the questions in Task 8.4 in the Student's Book.
- Discuss atmospheric pressure while referring to the text in the Student's Book.
- In the course of the discussion, ask the learners to do Activities 8.23 and 8.24 in the Student's Book.
- Ask the learners to answer the questions in Task 8.4 in the Student's Book. Discuss humidity while making reference to the text in the Student's Book. Begin

the discussion by reading the case study in the Student's Book and to answer the questions that follow.

- Explain the factors that influence the amount of humidity. Refer to the text of the Student's Book.
- Guide the learners in the field visit that is Activity 8.28 in the Student's Book.
- Discuss winds. Begin by asking the learners to do Activities 8.29 in the Student's Book.
- Discuss the types of winds while making reference to the text of the Student's Book.
- In the course of the discussion, ask the learners to do Activities, 8.31, 8.32, 8.33, 8.34, 8.35 and 8.36.
- Ask the learners to answer the questions in Task 8.6 in the Student's Book.
- Discuss clouds. Begin by asking the learners to do Activity 8.37 in the Student's Book.
- Discuss the types of clouds while referring to the text of the Student's Book.
- Give the learners Activity 8.38 as a takeaway assignment.
- Introduce sunshine. Begin the discussion by referring to the text of the Student's Book.
- Guide the learners in doing Activity 8.39 of the Student's Book.
- Discuss the factors that influence climate. Begin by asking the learners to do Activity 8.40 of the Student's Book. Discuss the factors by referring to the text of the Student's Book.
- Give the learners Activities 8.41.
- Ask the learners to answer the questions in Task 8.7 in the Student's Book.
- Discuss the climatic zones of the world. Refer to the text of the Student's Book.
- In the course of the discussion, ask the learners to do Activities 8.43 and 8.44 of the Student's Book.
- Explain the impact of weather and climate on human activities. Begin by asking the learners to do Activity 8.45 and 8.46 of the Student's Book. Referring to the text of the Student's Book, discuss the factors outlined.
- Together with the learners, go through the Did you know? section of the Student's Book. This section contains interesting facts about weather and climate in Rwanda.
- Ask the learners to answer the questions in the End of unit revision questions of the Student's Book.

Answers to Task 8.1

1. (a) Weather refers to the day to day conditions of the atmosphere.
   (b) Weather refers to the day to day conditions of the atmosphere while climate refers to the weather conditions in a given place over a long period of time.
2. Temperature, rainfall, wind, atmospheric pressure, humidity, sunshine and cloud cover.
3. (a) Atmosphere refers the thin

layer of gases that surrounds the earth.

(b) Mark correctly drawn diagrams showing the correct layers of the atmosphere i.e troposphere, stratosphere, mesosphere and thermosphere.

4. (a) Ozone layer refers to the region of Earth's stratosphere that absorbs most of the sun's ultraviolet (UV) radiation.

(b) The sun's insolation has dangerous rays called ultra-violet rays. These rays are dangerous to humans. The ozone layer filters the sun's insolation by removing these rays. The ozone layer regulates temperatures in the lower atmosphere. This prevents the melting of ice and effects of global warming

5. (a) This is the destruction of the ozone layer.

(b) Human activities such as pollution caused by gases and chemicals.

6. (a) This refers to any of the wavelengths at which electromagnetic radiation from space can penetrate the earth's atmosphere.

(b) Mark correct answers.

7. • The atmosphere facilitates the formation of rainfall hence raising the operations of the water cycle .
• The atmosphere provides air which is necessary for plant, animal and human life.
• The atmosphere provides case studies for research especially the meteorologists.
• The atmosphere shields the earth from ultra-violet rays which are harmful to all life forms on earth.
• The atmosphere facilitates wireless communication. This is due to the ionosphere where there are electromagnetic waves. These waves are reflected back to the earth's surface.
• The atmosphere regulates the temperatures experienced along the earth's surface where life exists (flora and fauna).
• The atmosphere and its associated winds are utilised to increase generation of electricity–wind energy.

Answers to Task 8.2

1. (a) This is a special box in which the main delicate weather instruments are kept. It houses the thermometer and the hygrometer.

(b) • It is made up of wood, this preferred to avoid the external heat.
• All the sides of the Stevenson screen have louvres to allow proper aeration.
• The Stevenson screen is painted white. This is purposely to reflect heat.
• Stevenson screen is placed on a grass covered ground.
• The Stevenson screen is placed

on a stand, about 121cm above the ground.

- It is located far away from obstacles such as buildings, trees or concrete fences.
- The Stevenson screen has a double boarded roof.

2.
- A school weather station enables the school administration and learners to save time and money.
- It provides a platform for practical studies to the learners.
- The school weather station can enable learners know the weather of their school environment.
- The school weather station acts as a laboratory for geography lessons.
- The practical studies facilitated by such stations enable learners to acquire various skills.

3. (a) Accept correct answers.
   (b) Mark correct answers.
   (c) Mark correct answers.
4. Hygrometer and thermometer.
5. (a) Temperature, isotherms.
   (b) Rain gauge
   (c) Windsock
   (d) Atmospheric pressure
   (e) Humidity, isohumes
   (f) Sunshine recorder, isohels
   (g) Cloud cover, isonephs

Answers to Task 8.3

1. Precipitation is the deposition of moisture in liquid or solid form.
2. - Rainfall
   - Frost
   - Dew
   - Hail etc.

   Accept other correct answers

Answers to Task 8.4

1. Mark correctly drawn diagrams explaining relief, convectional and frontal rainfall.
2. Mark correct answers
3. (a) Using a rain gauge
   (b) Mark correct answers
4. Mark correct answers.

Answers to Task 8.5

1. Accept correct answers
2. Accept correct answers
3. Accept answers
4. Accept correct answers

Answers to Task 8.6

1. Wind is moving air.
2. (a) Accept correct answers.
   (b) Mark correctly drawn diagrams of the wind vane, cup anemometer and windsock.
3. (a) Land breeze occurs at night and sea breeze during the day.

   Accept correct explanations of the differences between the two.

   (b) **Hammatan winds** – This wind originates from the Sahara desert. It is associated with a lot of dust .It usually results into a decrease in

temperatures due to the dusty haze created.

Sirocco winds – These are hot winds carrying large quantities of dust in North Africa. They usually blow between February and June. They share similarities with the hammattan winds.

(c) **Katabatic wind** – The descending cold wind during a mountain breeze.

Anabatic wind – The warm air that rises in the valley during a valley breeze.

4. (a) Mark correctly drawn diagrams and correct explanations of the formation of chinook winds.

(b) This is because the wind is associated with rising temperatures that result into snow to melt.

Answers to Task 8.7

1. - Precipitation
   - Air temperature
   - Prevailing wind
   - Plant cover
   - The presence and size of water body
   - Latitude
   - Atmospheric pressure

2. (a) **Rainfall** – This form of precipitation is made up of liquid water droplets. The droplets fall from the sky after condensation. Condensation refers to the process by which water changes its state from vapour to liquid.

(b) **Sleet** – This is made up of a mixture of rain and snow or partially melted snow. The mixture then falls on to the surface of the earth.

(c) **Snow** – This is frozen water particles from the higher atmosphere. It is a form of solid precipitation that is formed by sublimation of water vapour.

(d) **Frost** – When the temperatures are too low, dew freezes. Frozen dew is called frost.

3. (a) **Cirrus**

- They are made up of crystals that give it an appearance of white colour.
- They are the highest clouds in the atmosphere.
- They are thin and detached.
- They are feathery with tail filaments.
- They yield no precipitation.

(b) **Stratus**

- They consist of water droplets.
- They form a low uniform layer resembling fog.
- They are greyish white in colour.
- They are associated with dull weather and drizzle.

(c) **Cumulus nimbus**

- They are made of water droplets at the lower levels and ice crystals at the highest levels.
- They have a great vertical extent rising from a height of about 2100 metres to 9000 metres above the ground.
- They are big, heavy and black

in colour with a flat base.

- The top of the cloud spreads out assuming the shape of an anvil.
- Cumulonimbus clouds are associated with convectional currents which create rapid movement and mixing of air particles, leading to very heavy rainfall accompanied by thunder and lightning.
- They are associated with rain showers and hail. The showers are heavy and violent.

4. (a) Mist is used when visibility extends to 1 kilometre while fog is used when the visibility is less than 1 kilometre.

   (b) Hail stones – This refers to frozen raindrops that build into spherical ice particles.

5. Accept correct answers.

Answers to End unit assessment

1. (a) Weather refers to the day to day conditions of the atmosphere while climate refers to the weather conditions for a period of time.

   (b) Elements of weather and climate:
   - Sunshine
   - Temperature
   - Atmospheric pressure
   - Wind
   - Humidity
   - Cloud cover
   - Precipitation

2. (a) Atmosphere refers to the thin layer of gases that surrounds the earth.

   (b) - Troposphere
   - Stratosphere
   - Mesosphere
   - Thermosphere

   Accept correct explanations.

3. (a) Evaporation
   - Condensation and sublimation
   - Infiltration

   (b) - Rainfall
   - Frost
   - Dew
   - Snow
   - Thunderstorm
   - Haze
   - Fog
   - Hail
   - Rime
   - Sleet

4. Explain the factors influencing atmospheric pressure variation.
   - Altitude
   - Temperature
   - Rotation of the earth

5. - Sea breeze
   - Land breeze
   - Katabatic winds
   - Anabatic winds
   - Monsoon
   - Fohn/Chinook
   - Hammattan winds
   - Sirocco winds
   - Easterlies
   - Westerlies
   - Trade winds

   Accept correct answers.

6. - Cirrus

- Cirrocumulus
- Cirrostratus
- Altocumulus
- Altostratus
- Stratocumulus
- Stratus
- Nimbostratus
- Cumulus
- Cumulonimbus

7. - Latitudinal location
   - Altitude
   - Presence and absence of water bodies
   - Vegetation
   - Distance from the sea
   - Human activities
   - Ocean currents
   - Relief

8. (a) - Tropical zone
   - Temperate zone
   - Polar zone
   - Mountain zone

   (b) - Accept correct explanations of the characteristics.

9. - High and reliable rainfall in moderate levels supports the growth of crops. This ensures food security.
   - Moderate and abundant rainfall supports growth of grass hence favouring livestock farming. It also supports herbivorous wildlife hence developing the tourism sector.
   - Heavy and reliable rainfall supports the growth of trees of high value. This leads to the development of forestry and lumbering.
   - The warm tropical climate attracts many tourists who come to enjoy the warmth when they have winter in their homelands. This supports the tourism sector.
   - In areas with arid climates, humans are forced to find ways of irrigating the crops.
   - Heavy and reliable rainfall sustains water bodies like rivers, swamps, lakes and wetlands. All these support aquatic life, tourism sports and provide water that is used for domestic purposes.

Topic area: Physical geography

Sub-topic area: Vegetation

UNIT
9 Vegetation

Key unit competence: By the end of this unit, the learners should be able to determine the relationship between vegetation and human activities.

Unit objectives

In this unit, the learner should be able to;

1. Define vegetation.
2. Outline the factors that influence the distribution of natural vegetation.
3. Outline the importance of natural vegetation.
4. State the relationship between vegetation and human activities.

Content map

Unit 9	**Vegetation**
Number of periods	11
Introduction	Talking to the learners about vegetation. The learners should give examples of some vegetation.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Photographs, Internet, maps of vegetation.
Activities	• Observing vegetation in the local environment. • Interpreting photographs. • Discussing vegetation. • Identifying the characteristics of vegetation. • Outlining the importance of natural vegetation. • Stating the relationship between vegetation and human activities.

Competencies practiced	• Teamwork • Literacy • Interpreting information • Communication • Presentation of findings
Language	• Discussion in groups • Presentation of the findings
Vocabulary acquisition	Terms related to vegetation.
Study skills	• Locate different types of vegetation on maps. • Discuss the factors that influence vegetation distribution. • Discuss the importance of vegetation to man. • Explain the relationship between vegetation and human activities.
Revision	Tasks and end of unit revision tasks in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to identify different types of vegetation on maps. • Ability to know the importance of vegetation to man and factors that influence the distribution of vegetation. • Ability to explain the relationship between vegetation and human activities.
Learning outcomes	• Define vegetation. • Understand types of vegetation. • Know the factors that influence the distribution of vegetation. • Know the importance of vegetation. • Know the relationship between vegetation and human activities.

Additional information for the teacher

The population of Rwanda is growing rapidly. People have cut down vegetation – mainly trees, to create more land for settlement for the growing population. Nyungwe Forest National Park is a rainforest. It receives more than 2000mm of rainfall every year. It has around 200 species of trees and other vegetation. It is the only forest that covers a large area of land. The Volcanoes National Park has a lot of vegetation.

With the growing population, there is no more mountain grassland and moorland that once covered the land. The land is now covered by terraced agriculture. However, this has had a negative effect since there is a lot of soil erosion in some areas. This has made the soil to become less fertile thus the need for use of chemical fertilisers and manure.

In some areas, there are soils that are not rich for agriculture. These areas are covered by savannah and broad-leafed woodland species, acacia and grasses. Akagera National Park is covered by papyrus swamp and riverine forest.

Teaching steps

- Introduce the unit by taking the learners on a walk around the school as guided by Activity 9.1 in the Student's Book. Let the learners observe the types of vegetation, height of the vegetation and size of the leaves.
- Let them discuss their observations in their groups then present their findings in class.
- Give them the meaning of vegetation and the two main classifications of vegetation. Give them notes as you discuss with them.
- Take them through the natural vegetation. Talk about the forests, grassland, desert and swamp vegetation. Give them notes on the same.
- Take them through the artificial vegetation and give them notes.
- Ask the learners to study the map provided in Activity 9.2 in the Student's Book. Ask them to identify the different types of vegetation on the map.
- Teach them about secondary vegetation and explain to them the difference between secondary vegetation and artificial vegetation.
- Guided by Activity 9.3, let the learners observe the pictures provided. They should then answer the questions that follow and discuss their findings in class.
- Discuss with the learners the factors that influence the distribution of vegetation. Take them through each of the factors and use relevant pictures when explaining each factor. Give the learners notes as you discuss.
- Ask the learners to do Activity 9.4 in the Student's Book. They should present and discuss their findings in class.
- Ask them to do the Task 9.1 in the Student's Book as an assignment. Discuss with them in a class discussion.

– Guided by Activity 9.5, let the learners take a walk around their environment and find out the importance of vegetation. Let them write down their findings and discuss in class.

– Explain to them the importance of vegetation. Use pictures when discussing the importance.

– Give them Task 9.2 in the Student's Book. They should revise this in their groups.

– Using Activity 9.6 as a guide, let the learners find out the relationship between vegetation and human activities.

– Learners should then do Activity 9.7 as an assignment and present their findings in class.

– Give them the end of unit task as their assignment. Collect their books and mark their work. Revise with them in class.

Answers to Task 9.1

1. How the following influence the growth of vegetation;

(i) Climatic factors

- *Precipitation* –**Precipitation is the deposit of water in liquid or solid form on the earth's surface** from the atmosphere. The type and amount of precipitation influences the type and distribution of vegetation. Different plants have different moisture requirements.
- *Temperature* – Temperature plays an important role in the growth of vegetation. It determines plant processes such as germination, rate of plant growth, flowering, ripening of fruits and shedding of leaves.
- *Sunlight* – Sunlight is important to plants for photosynthesis. Long hours of sunlight encourage the growth of a variety of plants. Areas with fewer hours of sunlight have fewer plants. In the tropical rainforests, less light reaches the ground leading to bare ground. The trees are tall as they compete for sunlight.
- *Wind* – The moisture content and strength of the winds influences plant growth. Warm moist winds contain sufficient moisture. This helps in the formation of rainfall necessary for plant growth. Hot dry winds cause wilting of plants since they accelerate water loss from the plants. Strong winds cause the trees to bend.

(ii) Edaphic factors

This refers to soil particularly with respect to its influence on organisms. Deep well drained soils support a variety of large trees. Soils that are shallow in depth support the growth of shallow rooted plants such as grass.

The pH of the soil determines the type of plants found in a region. Soil with nutrients and humus support the growth of a wide variety of plants. Soils with few nutrients have a fewer variety of plants. They support very little

plant growth.

(iii) Topographic factors

Relief – Relief refers to the height between parts on the earth's surface. The height of the land determines temperature and rainfall. There is an increase in vegetation with an increase in altitude. This is distinct on mountains. The vegetation ranges from the grass to forests, bamboo, heath and moorland.

Slope – Steep slopes experience high rates of soil erosion leading to development of thin and shallow soils. This results in poor plant growth. Gentle slopes have deep and well drained soils resulting in the growth of thick vegetation and a wide variety of plants. Flat areas are waterlogged resulting in the growth of swamp vegetation.

Aspect – Aspect is the direction of the slope with regards to sunshine and rainfall. North facing slopes in the Southern Hemisphere and south facing slopes in the Northern Hemisphere are warmer. This is because they are exposed to sunlight. This results to the growth of a wide variety of plants and forests. The slopes that are not exposed to the sun have a few er variety of vegetation.

2. Accept correct explanation from the learners.

Answers to Task 9.2

1. Importance of vegetation to the economy of Rwanda;

- *Habitat for wild animals* – Forests and other vegetation provide a home for wild animals. Wild animals attract tourists. They earn the country foreign exchange that aids in economic development. Therefore, we should not destroy our vegetation.
- *Improve soil fertility* – Plant materials that fall from different vegetation decompose into humus. This improves the fertility of the soil. The decaying material increases the organic matter content in the soil. People can then practise agriculture and the produce exported to other countries.
- *Source of raw materials* – Vegetation is also a source of raw materials for industries. For example, trees are used in manufacture of paper, plywood and rubber.

2. Habitat of wild animals, source of medicine, source of timber and source of raw materials.

Answers to End unit assessment

1. Vegetation refers to all the plant cover growing in a particular area. It also refers to the ground cover provided by plants.

2. Different types of vegetation (Accept correct explanations from the learners for the different types of vegetation listed below).

- Natural vegetation – Forests, grassland, swamp and desert vegetation.
- Artificial vegetation.
- Secondary vegetation.

3. Factors that influence the distribution of vegetation.

- *Climatic factors*

  Climate is the weather condition in an area over a long period of time. The main elements of climate that influence vegetation include precipitation, temperature, sunlight and wind.

- *Edaphic factors*

  This refers to soil particularly with respect to its influence on organisms. Deep well drained soils support a variety of large trees. Soils that are shallow in depth support the growth of shallow rooted plants such as grass.

  The pH of the soil determines the type of plants found in a region. Soil with nutrients and humus supports the growth of a wide variety of plants. Soils with few nutrients have a fewer variety of plants. They support very little plant growth.

- *Topographic factors*

  Topography defines the physical features in a place. The topographic factors include relief, slope and aspect. These factors affect vegetation through soil formation processes, climate, soil moisture and soil nutrients.

- *Biotic factors*

  These are the living organisms which have an effect on the growth of vegetation.These include human beings, animals, bacteria, burrowing animals and insects.

  Bacteria help in the decomposition of organic matter to form humus in the soil which supports plant growth. Some bacteria may cause diseases which result in the destruction of certain plant species.

  Human activities such as deforestation, mining and overgrazing destroy vegetation. However, other activities such as agroforestry, reforestation, afforestation and creation of forest reserves result in the development of vegetation.

  Some insects aid in plant pollination. Pollination is the transfer of pollen grains from the male part of a flower to the female part. This leads to fertilisation. Animals and birds aid in seed dispersal leading to growth and distribution of vegetation.

  Burrowing animals and earthworms aerate the soil resulting in suitable conditions for plant growth.

4. Importance of vegetation to Rwanda.

- *Food* – Some vegetation are a source of food to human beings and animals. Some insects also feed on vegetation.
- *Habitat for wild animals* – Forests and other vegetation provide a home for wild animals. Wild animals attract tourists. They earn the country foreign exchange that aids in economic development. Therefore, we should not destroy our vegetation.
- *Source of medicine* – Some types of vegetation such as barks, roots and leaves of some trees are used as medicine. They are used in curing different diseases in both animals

and in humans.

- *Prevention of soil erosion* – Vegetation holds soil together. This prevents erosion by water and wind. Vegetation also reduces the speed of water when it is raining. Roots of vegetation hold soil particles together. This helps to reduce soil erosion and to conserve soil.
- *Purification of the air* – Vegetation purifies the air that we breathe. Utilise carbon dioxide in the atmosphere and release oxygen.
- *Improved soil fertility* – Plant materials that fall from different vegetation decompose into humus. This improves the fertility of the soil. The decaying material increases the organic matter content in the soil.
- *Source of timber* – Trees are a source of timber. This is used in making furniture and buildings. Trees are also a source of fuel. However, trees should not be cut carelessly. When one tree is cut, two more trees should be planted.
- *Source of raw materials* – Vegetation are also a source of raw materials for industries. For example, trees are used in the manufacture of paper, plywood and rubber.
- *Windbreaks* – Vegetation such as trees act as windbreaks. They help in reducing the speed of wind. This reduces the effects of wind such as blowing away roof tops or soil erosion.
- *Conserve soil and water* – The roots of vegetation help in conserving soil and water. They hold the soils together and conserve moisture in the soil.

5. Influence of natural vegetation on the following human activities;

(a) *Tourism* – Forests and other vegetation provide a home for wild animals. Wild animals attract tourists. They earn the country foreign exchange that aids in economic development. Therefore, we should not destroy our vegetation.

(b) *Livestock keeping* – In areas where there is a lot of land for grazing, people keep livestock on a large scale. In areas where the climate is good, livestock are kept due to availability of grass and other vegetation that the livestock feed on.

(c) *Building and construction* –Trees are a source of timber that is used when building. Grass and papyrus reeds are used for thatching the roofs of houses.

(d) *Medicine* –Some types of vegetation such as barks, roots and leaves of trees are used as medicine. They are used in curing different diseases in both animals and in humans.

6. How human activities have influenced the distribution of vegetation;

(a) *Overstocking* – Keeping large numbers of livestock on a small piece of land has led to destruction of vegetation. This in turn makes the soil to be left bare. This increases the rate of soil erosion making the soil infertile due to loss of the topsoil.

(b) *Mining* – In areas where there is mines, there is no vegetation since all vegetation is cleared.

(c) *Pollution* – Pollution of land, water and air has led to the destruction of vegetation. It has also brought about climate change due to global warming. The country is experiencing very high temperatures that are not conducive for vegetation growth.

(d) *Urbanisation* –The growth of urban centres has led to the destruction of vegetation. Establishment of industries in urban areas has also led to clearing of vegetation. The need for houses for settlement for the growing population in urban areas, has also led to the cutting down of trees to obtain building materials.

Diagnostic questions

1. Describe how biotic factors influence the distribution of vegetation.
2. Explain the difference between secondary vegetation and artificial vegetation.
3. Discuss forests as an example of natural vegetation.

Answers to diagnostic questions

1. How biotic factors influence the distribution of vegetation.

- These include human beings, animals, bacteria burrowing animals and insects. Bacteria help in the decomposition of organic matter to form humus in the soil which supports plant growth. Some bacteria may cause diseases which result in destruction of certain plant species.
- Human activities such as deforestation, mining and overgrazing destroy vegetation. However, other activities such as agroforestry, reforestation, afforestation and creation of forest reserves result in the development of vegetation.
- Some insects aid in plant pollination. Pollination is the transfer of pollen grains from the male part of a flower to the female part. This leads to fertilisation. Animals and birds aid in seed dispersal leading to growth and distribution of vegetation.
- Burrowing animals and earthworms aerate the soil resulting in suitable conditions for plant growth.

2. Secondary vegetation grows naturally in an area after being interfered with by people or animals and eventually acquires the characteristics of natural vegetation. Artificial vegetation is that which has been planted by human beings.

3. A forest is a large area of land covered by trees and other woody vegetation. The natural forests found in Rwanda are; the natural forests of Nyungwe National Park, Volcanoes National Park, Gishwati and Mukura Forest reserves. Most of the remaining natural forests in Rwanda are protected as national parks or forest reserves.

Topic area: Physical geography

Sub-topic area: Drainage

UNIT
10

General organisation of hydrography

Key unit competence: By the end of this unit, the learners should be able to analyse the general organisation of hydrography and its relationship with human activities.

Unit objectives

In this unit, the learner should be able to:

1. Define drainage.
2. State different types of water bodies.
3. Identify major rivers of the world.
4. Explain different parts of the river profile and their characteristics.
5. Identify different drainage patterns.
6. Explain the relationship between drainage and human activities.

Content map

Unit 10	**General organisation of hydrography**
Number of periods	11
Introduction	Give a general overview of hydrography and drainage.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Photographs, diagrams, Internet.
Activities	• Observing diagrams. • Interpreting diagrams. • Drawing diagrams. • Discussing on drainage. • Naming the drainage features. • Drawing the world map.

Competencies practiced	• Teamwork • Communication • Interpreting diagrams • Drawing maps and diagrams • Presentation of findings
Language	• Discussion in groups • Presentation of findings
Vocabulary acquisition	Drainage terminologies.
Study skills	• Observe and categorise different water bodies. • Explain the relationship between drainage and human activities. • Draw a sketch map of the world to locate major rivers. • Observe and categorise different drainage patterns in the environment.
Revision	Tasks and end of unit revision tasks in the Student's Book.
Assessment	• Ability to collect data, work in groups and present the findings. • Ability to interpret diagrams. • Ability to draw maps. • Ability to interpret maps.
Learning outcomes	• Understand hydrography and drainage. • Understanding types of water bodies. • Understanding drainage patterns. • Ability to work in groups and present data.

Additional information for the teacher

Rivers begin in upland areas and flow downhill, becoming deeper and wider until they reach the sea. A drainage basin is part of the water cycle where water is transferred in a continuous cycle between the sea, atmosphere and the land.

A river changes shape as it flows from its source to its mouth (where a river flows into a sea or lake). The shape of both the long profile and the cross profile changes.

Teaching steps

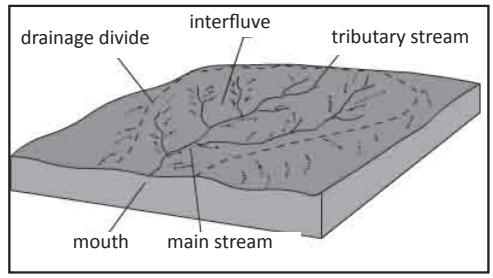
- Introduce the unit by telling the learners the meaning of hydrography. Let them write it down in their books. Ask them to read the text provided in the Student's Book.
- Discuss with the learners the meaning of drainage. Ask them to write in their exercise books.
- Talk about water bodies with the learners. Ask them to do Activity 10.2 in their groups. They should present their findings in class.
- Teach them about oceans, seas, lakes, ponds, reservoirs, swamps and rivers. Discuss each of these and use the respective pictures of the water bodies being discussed.
- Ask the learners to do Activity 10.3 in the Student's Book and to present their findings in class. Give them notes on what they have learnt.
- Give them Task 10.1 as an assignment and let them revise it in their groups.
- Let the learners do Activity 10.4 on the major rivers of the world. Let them study the world map in their atlases and locate the main rivers of the world. They should then identify their sources and mouths.
- Their findings should be presented in class. Ask them to study Table 10.1 in the Student's Book on some of the major rivers of the world. They should copy it in their books.
- The learners should do Activity 10.5 and 10.6 in the Student's Book. Mark the maps they have drawn.
- Tell the learners what a river profile is and let them write down the meaning in their books. The river profile has different parts. Ask them to do Activity 10.7 to find out the parts of a river profile.
- Using the diagram of the long profile in the Student's Book, ask the learners to outline the characteristics of the river in the upper, middle and mature stages of a river.
- Take them through the characteristics of parts of the river profile as they take down notes. They should also observe the pictures available in the book.
- Give them Task 10.2 as an assignment. They should then revise it in their groups.
- In relation to the definition of drainage that they learnt, ask the learners to define drainage patterns. They should then carry out Activity 10.8 and present their findings in class.
- Explain to them the different types of

drainage patterns. Use pictures and charts to show them the different types of drainage patterns. Give them notes during the lecture. Explain the factors that influence the development of each drainage pattern.

– Give them Task 10.3 as an assignment. Let them revise in a class discussion.
– Guide the learners to understand that the relationship between water bodies takes two dimensions namely; the influence of water bodies on human activities and the influence of human activities on water bodies.
– Ask the learners to carry out Activity 10.10 in the Student's Book. They should present their findings in a class discussion. Take them through the relationship between water bodies and human activities. They should take down notes during the discussion.
– Ask the learners to do Activity 10.11 in pairs. They should discuss their findings in class. Take them through the impacts of human activities on water bodies. Show them different pictures with the impacts that human activities have on water bodies. They should take down notes during the discussion.
– Using Activity 10.12 as a guide, ask the learners to discuss the importance of protecting water bodies. They should then present their findings in class. Ask them to take down short notes during the discussion.
– Ask the learners to do the end of unit revision task as an assignment. They should then collect their books. Mark their work and revise with them in a class discussion.

Answers to Task 10.1

1. Diagram of the features of the drainage system.



2. Lakes, ponds, rivers and swamps.
3. A perennial river is one that contains water throughout the year whereas an intermittent river is one whose surface water ceases to flow at some point in time.

Answers to Task 10.2

1. This is the shape of a river along its course from the source to the mouth. The long profile is expressed graphically as a curve.
2. Stages of the long profile of a river.

- Youthful stage
- Middle stage
- Old stage

3. Features found in each stage of the long profile of a river.

- Youthful stage – The features found in this section include pot holes, gorges, interlocking spurs, plunge pools, rapids and waterfalls.
- Middle stage – Features found in this section include meanders, river cliffs, bluffs and slip-off slopes.

- Old stage – Features found in this section include ox-bow lakes, flood plains, meanders, river braids and deltas. Others are islands, natural levees, deferred tributaries, alluvial fans, bluffs, river terraces, river cliffs, marshes and swamps.

4. **Youthful stage**
   - The river has a steep gradient.
   - The water flows at a very high speed.
   - There is a deep steep sided river valley.
   - It has a narrow channel.
   - Vertical erosion is dominant
   - The river channel is V-shaped.
   - It has various features produced by vertical erosion, abrasion and hydraulic action.

   Middle stage
   - The river has wide U-shaped valley.
   - The gradient of the river channel is gentle.
   - The water speed is moderate.
   - There is high stream volume.
   - The river erodes its valley laterally thus widening it.
   - Both erosion and deposition take place at this stage.

   Old stage
   - The gradient of the river channel is very low.
   - The speed of the river is very low.
   - The stream volume is large.
   - The river valley is wide and U-shaped.
   - Deposition occurs on the river channel making it shallow.
   - The river has wide flood plains.

Answers to Task 10.3

1. A drainage pattern refers to the arrangement of a river and its tributaries on the earth's surface. Drainage patterns tell a lot about the land.

2. Factors that influence the formation of drainage patterns.
   - The slope of the land
   - Differences in the rock resistance
   - Rock structure

3. Characteristics of drainage patterns.

(a) *Dendritic* – This drainage pattern looks like a tree trunk and its branches. The tributaries flow towards the main river from many directions. They join the main river at acute angles. This pattern develops in an area with gentle slopes with fairly uniform rock type. The direction of flow is influenced by the slope. It is common on massive crystalline rocks such as granite. It also develops on horizontal gently dipping sedimentary rocks.

(b) *Radial* – This is a drainage pattern that forms on volcanic cones or domes. The rivers flow outwards from a central high point. The pattern resembles the spokes of a bicycle wheel. The slope influences the direction of flow of the rivers.

(c) *Centripetal* – This is a drainage pattern where rivers flow from all directions into a common basin. The common basin could be a swamp or a lake. The direction of flow of the rivers is influenced by the slope.

(d) *Trellis* – This is a pattern where the tributaries join the main river at

right angles. The minor tributaries also join the main tributaries at right angles. It develops in areas where there are alternate layers of hard and soft rocks. These rocks lie at right angles to the main direction of the slope. The main river is powerful enough to cut through the hard rocks while the tributaries cut through the soft layers of rocks at right angles. The minor tributaries cut valleys into the less resistant rocks. The hard layers of rocks protrude as ridges.

Answers to End unit assessment

1. Drainage refers to the natural or artificial removal of surface and sub-surface water from an area.

2. Oceans, seas, ponds, swamps, rivers and lakes.

3. Terminologies related to drainage.

- *Banks* – The sides of a river or stream between which the water normally flows.
- *Catchment area* – The area from which rainfall flows into a river, lake, or reservoir.
- *Channel* – An area that contains flowing water confined by banks.
- *Confluence* – The junction of two streams or rivers or of a stream and a river.
- *Debris* – Loose natural material consisting especially of broken pieces of rock that deposit into a river or water system.
- *Distributary* – A stream that branches off and flows away from the main river channel. Distributaries are common in the river deltas.
- *Drainage basin/river basin/ catchment area* – The area drained by a river and all its tributaries or by a single river system.
- *Effluent*– Wastewater.
- *Flood*– A relatively high flow as measured by discharge quantity.
- *Floodplain* – An almost flat, alluvial lowland bordering a stream. It is subject to flooding.
- *Groundwater* – This is subsurface water that is in the zone of saturation, from which wells, springs, and groundwater runoff are supplied.
- *Headwaters* – These are streams and rivers (tributaries) that are the source of a stream or river.
- *Interfluves* – These are high areas in between the tributaries.
- *Mouth* – The point where the river ends.
- *Outlet*– Downstream opening or discharge end of a pipe, culvert, ditch or canal.
- *River discharge* – The total volume of water flowing through a river channel at a given point. It is measured in cubic metres per second.
- *River regime* – The variation in the discharge of a river over the year.
- *River system* – This is the main river and all its tributaries.
- *Riverbed*– The bottom of the river.
- *Runoff*– Runoff is water that drains

into a river.

- *Source* – This is the point where a river originates from.
- *Tributary* – A river or stream flowing into a larger river or lake.
- *Trunk* – The main course of river.
- *Water shed or water divide* – This is the ridge or highland that separates two drainage basins.
- *Water table*– The upper level of a zone of saturation in the earth.
- *Wetland*– An area that is saturated by surface or ground water. It includes swamps and marshes.

4. Major rivers of the world and continents where they are located.

Region	**River**
Africa	- Nile - Niger - Congo
South America	- Amazon - Parana
North America	- Rio Grande - Mississippi - Missouri - Yukon - Mackenzie
Europe	- Rhine - Danube - Volga
Asia	- Ob - Yenisey - Lena - Amur - Huang - Yangtze - Mekong - Ganges - Indus
Middle East	- Tigris - Euphrates
Australia	- Murray Darling

5. Parts of a river profile and its characteristics.

Cross river profile

This is the transverse profile of a river from one bank to another. The river cross profile changes from the upper to the lower course.

Long profile

This is the shape of a river along its course from the source to the mouth. The long profile is expressed graphically as a curve. It has a steep gradient near the source but gradually flattens towards the river mouth.

The profile of a river is ideally expected to be smooth. However, this never occurs since the energy of the river changes as it flows through its course.

6. Drainage patterns

- *Radial drainage pattern* – This is a drainage pattern that forms on volcanic cones or domes. The rivers

flow outwards from a central high point. The pattern resembles the spokes of a bicycle wheel. The slope influences the direction of flow of the rivers.

- *Dendritic drainage pattern* – This drainage pattern looks like a tree trunk and its branches. The tributaries flow towards the main river from many directions. They join the main river at acute angles. This pattern develops in an area with gentle slopes with fairly uniform rock type. The direction of flow is influenced by the slope. It is common on massive crystalline rocks such as granite. It also develops on horizontal gently dipping sedimentary rocks.
- *Trellis drainage pattern* – This is a pattern where the tributaries join the main river at right angles. The minor tributaries also join the main tributaries at right angles. It develops in areas where there are alternate layers of hard and soft rocks. These rocks lie at right angles to the main direction of slope. The main river is powerful enough to cut through the hard rocks while the tributaries cut through the soft layers of rocks at right angles. The minor tributaries cut valleys into the less resistant rocks. The hard layers of rocks protrude as ridges.
- *Centripetal drainage pattern* – This is a drainage pattern where rivers flow from all directions into a common basin. The common basin could be a swamp or a lake. The direction of flow of the rivers is influenced by the slope.
- *Parallel drainage pattern* – This is a drainage pattern where the main river and its tributaries flow parallel to each other. It occurs over a large area. The slope determines the direction of flow of the river. It is common on steep slopes and escarpments. Tributaries join the main river at small acute angles.
- *Fault guided drainage pattern* – This is a drainage pattern where rivers flow along fault lines. This occurs in areas that have experienced faulting. The direction of flow is influenced by the faults. The tributaries form very sharp bends along their course. This drainage pattern is also referred to as rectangular drainage pattern.
- *Annular drainage pattern* – This is a drainage pattern around a basin or crater. It forms when the main river and its tributaries are arranged in a series of curves around a basin. The tributaries join the main river at sharp angles. Lake Bosumtwi in Ghana forms this pattern.

7. (a) How water bodies influence human activities.

- *Settlements* – Water bodies that contain fresh water attract human settlements. This is because they provide water for domestic use.
- *Agriculture* – Fresh water bodies encourage agriculture by providing water which is used for irrigation. Rivers deposit alluvium in the flood plains. Alluvium contains fertile soils which are used for growing crops. The water bodies also provide water for livestock to drink encouraging livestock keeping.

- *Transport* – Lakes, seas, oceans and navigable rivers provide a cheap means of transport for people and goods.
- *Fishing* – Water bodies such as oceans, lakes and rivers are good habitats for fish and other aquatic life. Fishing is carried out in such water bodies for subsistence and for sale.
- *Mining* – Some water bodies contain minerals in their beds. These minerals are mined. Mining takes place as an economic activity. Minerals which are mined in water bodies include salt, trona and gold.
- *Tourism* – Water bodies form beautiful sceneries e.g. waterfalls and sandy beaches which attract tourists. Tourism earns foreign exchange which is used for economic development.
- *Recreation* – Some water bodies offer recreational activities. Water sports such as surfing, yachting and sport fishing are some recreational activities that people engage in.
- *Industries* – Water bodies such as rivers and lakes provide water which is used for industrial purposes. Water bodies also provide raw materials which encourage the establishment of industries. The presence of fish leads to the establishment of fish related industries.
- *Ports* – Some rivers have suitable sites for the construction of ports and harbours. Rias and estuaries at river mouths are used for construction of ports. Fiords form natural harbours.
- *Hydro-electric power generation* – Some rivers have been dammed and their water is used to generate hydro-electric power. The power is used for domestic and industrial purposes.
- *Building materials* – Lakes and rivers contain sand, gravel and pebbles on their beds. These materials are extracted and used as building materials.
- *Flooding* – Water bodies such as rivers may flood causing the displacement of people, destruction of property. Floods also cause loss of lives.
- *Water-borne diseases* – Water bodies can be breeding grounds for disease carrying organisms. Mosquitoes and snails transmit malaria and bilharzia which are waterborne diseases.

(b) How human activities influence water bodies;

Sedimentation – Human activities such as farming, clearance of forests, mining and building of roads expose the soils to erosion. The soils are washed by surface runoff and are eventually deposited in the water bodies. This interferes with navigation and result in flooding of the areas adjacent to the water bodies.

Deforestation – The clearance of vegetation in the catchment areas exposes the soil to erosion leading to sedimentation in the water bodies.

Pollution – Industrial wastes, sewage and surface runoff from the farm lands are disposed into the water

bodies. They cause pollution making the water unfit for use. Gases emitted from factories and vehicles are released into the atmosphere. This leads to the formation of acid rain which damages vegetation and pollute the water.

Excessive use of water –The excessive use of water from the surface and underground sources leads to drying up of water bodies. Such water bodies include lakes, rivers and aquifers. Some of the rivers experiencing excessive use of water include Rivers Niger and Nile.

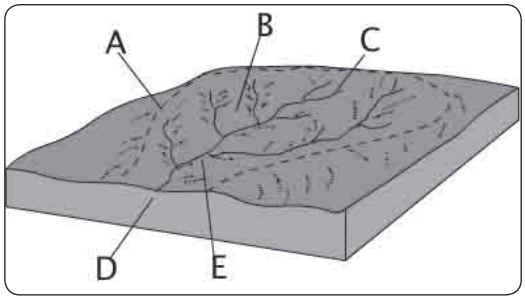
Climate change – Some human activities lead to climate change. Climate change can result in wetter or drier climates in some regions of the world. In drier climates, a decline in the water bodies is witnessed.

Landscape changes – The drainage of swamps to create dry land for agriculture interferes with the water balance. The water cycle is also destroyed leading to the depletion of wetlands. It also affects the flow of water into the lakes, eventually affecting their sizes.

Urban growth –The expansion of urban centres results in increased contamination of underground water and surface water bodies. This occurs by direct discharge and surface runoff. Contamination can occur directly through seepage of soluble contaminants from septic tanks, landfills and other industrial wastes.

Diagnostic questions

1. What is the meaning of the term water bodies?
2. Label the diagram below correctly.



3. What is the name of the diagram shown in (2) above?
4. What is the meaning of a distributary?

Answers to diagnostic questions

1. A water body is any significant accumulation of water on the earth's surface.
2. A – Drainage divide
   B – Interfluve
   C – Tributary stream
   D – Mouth
   E – Main stream
3. Drainage basin
4. A stream that branches off and flows away from the main river channel. Distributaries are common in the river deltas.

Topic area: Physical geography

Sub-topic area: Man and his environment

UNIT
11

Hazards

Key unit competence: By the end of this unit, the learners should be able to propose responses to the effects of natural and non-natural hazards in their environment.

Unit objectives

In this unit, the learner should be able to:

1. Define hazard.
2. Identify different types of hazards.
3. State the causes of hazards.
4. State the effects of hazards.
5. Explain the human responses to hazards.

Content map

Unit 11	**Hazards**
Number of periods	5
Introduction	Talk about hazards. Ask learners to name some of the hazards.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Photographs, Internet.
Activities	• Interpreting photographs. • Group discussions on hazards. • Analysis and conclusions from data collected. • Presentation of findings.
Competencies practiced	• Teamwork • Presentation of findings • Communication • Interpretation of photographs.

Language	• Discussion in groups • Presentation of findings
Vocabulary acquisition	Terms related to hazards.
Study skills	• Examine different types of hazards. Natural and human caused hazards. • Analyse the cause and effects of hazards. • Propose possible solutions to the effects of hazards and their preventive measures.
Revision	Tasks and end of unit revision task in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to identify and explain the types of hazards. • Ability to explain the causes, effects and preventive measures of hazards.
Learning outcomes	• Understanding the natural and non-natural hazards. • Understanding that hazards have causes, effects and solutions. • Teamwork. • Know the human responses to hazards. • Identify the hazards experienced in Rwanda.

Additional information for the teacher

A hazard involves something that could be potentially harmful to a person's life, health, property or the environment. Hazards cause a lot of damage to the environment. Their causes should be known and some preventive measures put in place to avoid their occurences. There are some hazards that occur naturally and thus cannot be prevented. Control measures should be put in place to ensure that people know how to handle the situation when such hazards occur.

There are two main categories of hazards; those that occur naturally and those that are caused due to various human activities.

Earthquakes which occur in settled areas result in loss of lives, destruction of property, damage to roads, destruction of telephone and power lines, and displacement of people. Earthquakes can be overcome by moving people away from earthquake prone areas and building structures such as houses that can withstand the impact of earthquakes.

Floods may be caused by blockage of urban drainage channels, high rainfall in the catchment areas leading to an increase in the stream volume, presence of low-lying land where water spreads over a wide area, siltation in the river channels which makes them shallow or increase in lake or sea level which drowns the adjacent lands. Floods lead to loss of lives, destruction of property, damaged roads, washed away bridges, washed away crops and displacement of people. Floods can be controlled by planting trees in the catchment areas, dredging the river channels to make them deeper and clearing the drainage channels regularly. Some of the countries that experience flooding in Africa include Kenya, Mozambique, Zambia, Zimbabwe, Botswana and Madagascar.

Volcanic eruptions may cause air pollution. Lava and volcanic ash may burry vegetation and buildings. They cause displacement of people. Volcanic ash and lava may also form fertile soils which are used for farming and volcanic features such as mountains that attract tourists.

Teaching steps

- Ask the learners to do Activity 11.1 individually. Discuss with them their findings in class. Introduce the unit by telling them the meaning of hazards. They should write the meaning in their exercise books.
- Let the learners do Activity 11.2 in pairs and discuss with them in class. Talk about the two types of hazards.
- Teach them about natural hazards and let them name some of them. Guided by Activity 11.3 in the Student's Book, discuss with the learners about floods. Discuss the causes, effects and prevention and control measures for floods. Give them notes.
- Let the learners do Activity 11.4 in pairs and discuss with them in class.
- Discuss with the learners about earthquakes. Discuss the causes, effects, prevention and control measures for earthquakes. Give

them notes.

- Ask them to do Activity 11.5 as an assignment and discuss with them in the next lesson.
- Guided by Activity 11.6 in the Student's Book, discuss with the learners about droughts. Discuss the causes, effects, prevention and control measures for droughts. Give them notes and use relevant pictures while explaining.
- Ask the learners to read the case study in the Student's Book and answer the questions that follow. Discuss with them the causes, effects, prevention and control measures for epidemics. Give them notes.
- Let the learners do Activity 11.7 in groups and discuss with them their findings in class.
- Discuss landslides with the learners. Discuss the causes, effects, prevention and control measures for landslides. Show them various pictures of places that have been hit by landslides. Give them notes.
- Using Activity 11.8 in the Student's Book as a guide, discuss with the learners about volcanic eruptions. Discuss the causes, effects, prevention and control measures for volcanic eruptions. Give them notes and use relevant pictures while explaining.
- Ask the learners to do Activity 11.9 as an assignment and discuss with them in the next lesson.
- Introduce the area on man-made hazards. Ask the learners to give some examples of man-made hazards.
- Guided by Activity 11.10 of the Student's Book, discuss with the learners about pollution. Discuss the causes, effects, prevention and control measures for pollution. Give them notes and use relevant pictures while explaining different types of pollution.
- Let the learners do Activity 11.11 in groups and discuss with them their findings in class.
- Discuss with the learners about wars. Discuss the causes, effects, prevention and control measures for wars. Show them various pictures of places that have been hit by wars. Give them notes.
- Using Activity 11.12 in the Student's Book as a guide, discuss with the learners about famine. Discuss the causes, effects, prevention and control measures for famine. Give them notes and use relevant pictures while explaining.
- Let the learners do Activity 11.13 in pairs and discuss with their findings in class.
- Discuss with the learners about accidents. Discuss the causes, effects, prevention and control measures for accidents. Show them various pictures of different accidents. Give them notes.
- Ask the learners to do Activity 11.14 and present their findings in class. Teach them about responses to hazards. Discuss with them short term, medium term and long term

responses to disasters.

– Divide the learners into groups of ten and let them act out the skit in Activity 11.15 of the Student's Book.
– They should also do the project outlined in Activity 11.16 the Student's Book. Guide them through this activity to ensure that it is successful.
– Ask them to do the End of unit revision task as an assignment. Collect their books and mark their work. Revise with them in class. Put emphasis in their areas of weakness.

Answers to End unit assessment

1. Hazards are events or activities that cause a threat to life, health, property or the environment. Hazards can cause great harm to life on the earth and to the physical environment.

2. Types of hazards.

- *Natural hazards* – These are naturally occurring events that have negative effects on the environment and on people. Human beings have no control over natural hazards. However, some measures can be put in place to reduce their effects. Examples of natural hazards include floods, earthquakes, drought, epidemics, landslides, volcanic eruptions and strong winds.
- *Human-caused hazards* – These are disastrous events caused directly by identifiable, deliberate or negligent human actions. They are also known as non-natural disasters. These hazards include pollution, wars, famine, accidents, fire and terrorism.

3. Hazards that have been experienced in Rwanda. Accept correct answers for different types of responses to different types of disasters from the learners.
4. Responses to hazards are important to Rwanda as they help to ease a problem that has occurred and needs immediate solution.
5. Accept correct answers from the learners.

Diagnostic questions

1. What are the causes of floods?
2. Explain the effects of pollution.
3. Discuss the ways of preventing and controlling epidemics.

Answers to diagnostic questions

1. Causes of floods.

- *Soil deposition* – Soils are usually deposited on river beds due to erosion. This makes the river beds shallow. The increase in river water due to high rainfall makes water to spill over the banks thus causing floods.
- *High rainfall* – High rainfall in catchment areas releases large volumes of water into the rivers. This causes the rivers to burst the banks as the water flows to the adjacent lands.
- *Blocked drainage systems* – Blocked drainag e systems in the urban areas cause water to flow on the surface.
- *Earthquakes* – They cause tsunamis

in the oceans which flood coastal lowlands.

- *Low gradients of the river channels* – Low gradients of river channels in the old stage lead to low stream velocity. This causes the load to be deposited in the river channel making it shallow. The water spills over the river banks causing flooding.

2. Effects of pollution.

- *Climate change* – Pollution leads to the release of gases into the atmosphere. This causes the climate to change. Temperatures become high due to global warming. This has a huge impact on agricultural production.
- *Poor health conditions among people* – Air, water and land pollution have adverse effects on the health of the people. Water pollution leads to the spread of water borne diseases. Air pollution leads to respiratory infections.
- *Death of aquatic life* – Oil spillage in water causes aquatic animals to be deprived of oxygen. This causes them to die.
- *Reduction in agricultural production* – Climate change causes unfavourable conditions for agriculture. The crop yields reduce leading to food insecurity. Excessive use of fertilisers also cause soils to be acidic. They are therefore not suitable for crop production. This is because the soils become infertile.
- *Formation of acid rain* – Chemicals and smoke in the air cause the formation of acid rain. Acid rain destroys aquatic life. It also destroys the leaves of plants leading to lose of vegetation cover.

3. Ways of preventing and controlling epidemics.

- *Vaccination*– People should be vaccinated against various diseases that may cause death rapidly. This will protect them against infection.
- *Proper hygiene* – Most epidemics are brought about by lack of proper hygiene. People should practice personal, environmental and food hygiene to prevent outbreaks of diseases such as cholera and typhoid.
- *Education* – People should be educated on different types of epidemics and their effects to the community. They should also be educated on how to protect themselves against infection and how to handle the epidemics if they get infected. For example, people can be educated on HIV/Aids and other diseases.
- *Eating a balanced diet* – A diet that has all the nutrients needed by the body will make the immune system strong. This will make people resistant to certain diseases. Lack of nutrients in the body makes the body's immune system weak.

Topic area: Human and economic geography

Sub-topic: Population, settlement and urbanisation

UNIT
12 Population and settlement

Key unit competence: By the end of this unit, the learners should be able to explain general population concepts and settlement patterns (rural and urban).

Unit objectives

By the end of this unit, the learner should be able to:

1. Define population and associated concepts.
2. Identify types of settlement.
3. Define concept of migration.

Content map

Unit 12	Population and settlement
Number of periods	8
Introduction	Defining and discussing the definition of population and population census.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Geographical documents, photographs, maps, graphs, audio-visual video clips, newspapers, Internet, local environment, tactile and talking materials.
Activities	• Defining population and population census. • Discussing the population structure and composition. • Explaining the importance of a population structure. • Discussing population distribution and density. • Discussing population growth. • Explaining factors which influence population growth rate. • Describing settlement. • Discussing the types of settlements. • Discussing migration and the types of migration.

Competencies practiced	• Teamwork • Presentation of findings • Interpretation • Communication • Literacy
Language	• Discussion in groups • Class presentations
Vocabulary acquisition	Terminologies related to population and settlement.
Study skills	• Explain different population and settlement concepts. • Observe various types of settlement patterns. • Differentiate between internal and external migration.
Revision	Tasks and end of unit revision task in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to define population and accepted concepts. • Ability to identify types of settlement. • Ability to define the concept of migration. • Ability to work in groups.
Learning outcomes	• Know the definition of population and accepted concepts. • Know the types of settlement. • Know the concept of migration.

Additional information for the teacher

It is the responsibility of the teacher to connect the findings of the learners from the activities that they carry out to the actual content and objectives of the unit. However, it is good to first let them (learners) suggest the topic of the day after the first activity. This aims at painting a broader picture in the minds of the learners.

Teaching steps

- Introduce this unit by asking the learners to do Activity 12.1 in the Student's Book. They should count themselves in class then identify the number of males and females. They should also use the data that they have collected to draw a chart which they should display in class.
- They should also do Activity 12.2 under your guidance.
- Teach them the meaning of population and its concepts then teach them about population census.
- Ask the learners to do Task 12.1 and discuss in their groups.
- Ask the learners to do Activity 12.3 to find out about population structure and composition.
- Teach them about population structure and composition and explain to them the importance of a population structure.
- Guided by Activity 12.4, let the learners describe how population is spread out in their school. Take them through population distribution and density.
- Ask the learners to do Task 12.2 and discuss in their groups.
- Guided by Activity 12.5 in the Student's Book, let the learners determine the population density of each country that has been shown in Table 12.3 and present their findings in class.
- They should then do Activity 12.6 to analyse the effects of high population density on the environment.
- Ask them to do Task 12.3 as an assignment and to discuss their findings in groups.
- They should then read the case study on population growth and answer the questions that follow.Teach them about the population growth concepts. Start with birth rate. Ask them to do Activity 12.7 by studying and analysing the population of their area.
- Using Activity 12.8 as a guide, let the learners individually find out the sizes of the families in their neighbourhood and explain the reasons for the varying sizes.
- Teach them about fertility rate and give them notes.
- Ask the learners to do Task 12.4 in the Student's Book as an assignment. They should and discuss their findings in their groups.
- Teach them about growth rate and death rate, natural increase and natural decrease and let them do Activity 12.9 and 12.10 then make class presentations.
- Teach them the factors that influence population growth and let them do Activity 12.11 and present their

findings in class.

– Ask the learners to do Activity 12.12 in pairs and to make class presentations. Introduce to them the subtopic on settlements.

– They should then do Activity 12.13. Discuss the types of settlements.

– Ask them to do Task 12.5 as an assignment then let them discuss it in their groups.

– Before teaching them about migration, let them do the respective activities. Take them through the concept of migration and the types of migration.

– Give them the End of unit revision task as an assignment. Collect their books and mark their work then revise with them in class.

Answers to Task 12.1

1. Population distribution is the spread of people across the area where people live.
2. Population structure refers to the composition of a given population. It is broken down into categories such as age and gender.
3. (a) Most developing countries have a population pyramid that is broad at the base like the one above. This means that there are more young people and few aged ones.
   (b) The population structure of a developed country is narrow at the base and wider than that of a developing country towards the apex. The middle part of this population structure is wide.
4. Refer to the Student's Book.

Answers to Task 12.2

1. Population density refers to the number of people living per unit area. The unit area is usually in square kilometres.
2. To determine the population density of an area, the total population of an area is divided by the total size of the area.
3. The knowledge on population density enables the country to allocate resources appropriately. This is in proportion to the number of people.
4. 977 persons per km^2.

Answers to Task 12.3

1. Fertility rate refers to the number of children that would be born to a woman in her lifetime. Birth rate refers to the number of live babies born in a year for every 1000 people in the total population.
2. Factors that influence fertility rate in any given region include; economic constraints, cultural and traditional beliefs, poor feeding on the side of mothers and diseases.
3. This is an open question. Accept correct answers from the learners.

Answers to Task 12.4

1. A settlement refers to a place where people live and establish their homes. It refers to forms of human habitation from a single dwelling to the largest city.
2. (i) Rural settlements are villages

occupied by people involved in primary production such as subsistence agriculture.

(ii) Urban settlements are areas occupied by people who are involved in trade, commerce and industrial activities.

3. (i) A nucleated settlement is a settlement pattern where people cluster together to form compact settlements. A sparse settlement is a type of settlement that consists of isolated dwellings which are scattered over a large area.

(ii) Linear settlement is a common kind of settlement pattern where homesteads and houses are arranged in lines. The houses are located on either side of certain features like roads, railways, rivers or along a coast.

Answers to End unit assessment

1. Population is a term used to refer to the number of people living in an area at a given time.

2. (a) Population structure refers to the composition of a given population. It is broken down into categories such as age and gender.

(b) Population distribution is the spread of people across the area where people live. Population density refers to the number of people living per unit area. The unit area is usually in square kilometres.

3. Population census helps with studying the population distribution, population structure and composition, factors that influence population distribution, the effects of population levels on the available resources and socio-economic state of the society.

4. (a) Birth rate refers to the number of live babies born in a year for every 1000 people in the total population. Death rate refers to the number of people dying per 1000 people in the total population. Growth rate refers to the natural change in the number of people living in a given area or country. This change is by an increase or decrease expressed in percentage.

(b) Natural increase is the difference between the number of births and number of deaths. It occurs when the birth rate exceeds the death rate. Natural decrease is a condition that occurs when the death rate exceeds the birth rate. It results in a low population growth rate.

5. (a) A settlement refers to a place where people live and establish their homes. It refers to forms of human habitation from a single dwelling to the largest city.

(b) Refer to the Student's Book.

6. (a) Migration is a term used to refer to the movement of

people from one place to another for specific purposes.

(b) Refer to the student's Book .

(c) The purposes of migration could be in search of jobs, search for pasture, search for better living conditions or as a result of civil war.

Topic area: Human and economic geography

Sub-topic area: Economic activities and development studies

UNIT
13 Economic activities

Key unit competence: By the end of this unit, the learners should be able to categorise the various economic activities and their importance on development.

Unit objectives

In this unit, the learner should be able to:

1. Define economic activity.
2. State the types of economic activities.
3. Explain the importance of economic activities.

Content map

Unit 13	**Economic activities**
Number of periods	5
Introduction	Talking about economic activities. Ask learners to name economic activities.
Classroom organisation	Whole class orientation followed by group work and individual work.
Equipment required	Photographs, Internet, maps, graphs, video clips, newspapers, poster paper, reports and geographical documents.
Activities	• Interpreting photographs. • Discussing economic activities. • Naming various economic activities. • Analysis and conclusion from data collected. • Presentation of findings.
Competencies practiced	Teamwork • Presentation of findings • Communication • Interpretation of photographs

Language	• Discussion in groups • Presentation of findings
Vocabulary acquisition	• Economic activities terminologies. • Terms used in explaining economic activities.
Study skills	• Describe the various economic activities carried out around your school. • Explain the importance of economic activities on sustainable development.
Revision	Tasks and end of unit revision tasks in the Student's Book.
Assessment	• Ability to work in groups and communicate ideas with others. • Ability to describe the various economic activities carried out around your school. • Ability to explain the importance of economic activities on sustainable development.
Learning outcomes	• Understanding the types of economic activities. • Knowing the importance of economic activities. • Knowing the economic activities that are carried out in Rwanda.

Additional information for the teacher

Economic activities are related to production, distribution, exchange and consumption of goods and services. The primary aim of the economic activity is the production of goods and services with a view to make them available to the consumer.

Characteristics of economic activities

There are different characteristics of economic activities. These activities have been outlined below.

- *Wealth producing activities* – These are economic activities that are done

with the aim of generating wealth.

- *Satisfying human wants* – These activities are used in meeting all the needs of human beings. These may be the current needs or needs for the future. For example, a person can use money earned to acquire needs. On the other hand, a person can save money earned for use in the future.
- *Source of money/income* – Economic activities are carried out with the aim of generating money or income. This helps people to meet their basic needs and wants.
- *Developmental activities* – Economic activities are developmental activities. They are used in the growth of a country or an area.

Economic activities are important for the following reasons; they provide food, employment opportunities, income to people, source of foreign exchange and source of raw materials for industries.

Teaching steps

– Begin the unit by taking the learners for a walk around the school. Guided by Activity 13.1 in the Student's Book. Let them identify some of the activities that people do for a living. Discuss with them in class.

– Tell them the meaning of economic activities and let them record in their books.

– Teach them examples of economic activities. Start with primary economic activities as outlined in the Student's Book.

– Ask the learners to discuss the photographs in Activity 13.2 in pairs.

– Guide the learners by explaining primary economic activities. Ask the learners to give examples of primary economic activities in Rwanda. Give them notes.

– Ask the learners to study the photographs in Activity 13.3 and answer the questions that follow.

– Guide the learners by explaining to them secondary economic activities. Ask them to give examples of secondary economic activities in Rwanda. Give them notes.

– Ask the learners to study the photographs in Activity 13.4 and to answer the questions that follow.

– Guide the learners by explaining tertiary economic activities. Ask them to give examples of tertiary economic activities in Rwanda. Give them notes.

– Ask the learners to carry out Activity 13.5 in the Student's Book as an assignment and to discuss their findings in a class discussion.

– Using Activity 13.6 as a guide, let the learners discuss the importance of economic activities. They should then present their findings in class.

– Explain to them the importance of economic activities and give them notes. Ask them questions to test their understanding.

– Let the learners carry out Activity 13.7 and 13.8 as an assignment and discuss in their groups. Each group should then present their findings in a class discussion.

– Give them the End of unit revision task as an assignment. Collect their books and mark their work. Revise with them in class.

Answers to End unit assessment

1. (a) Examples of primary economic activities include crop cultivation, livestock farming, mining, forestry, fishing and quarrying.

(b) Accept correct answers from the learners.

2. (a) Secondary economic activities are those that utilise the products from the primary economic activities. They change the raw materials into semi-processed or finished products.

(b) Steel making, textile and milk production.

3. (a) Tertiary economic activities are those that provide services to people.

(b) They have professionals who provide services for the primary and secondary economic activities' sector.

(c) Jobs for people in the tertiary economic activities;

- Transport and communication
- Tourism
- Banking
- Trade
- Insurance
- Administration
- Entertainment

4. Accept correct answers from the learners on the main economic activities in Rwanda.

5. Importance of economic activities to the economy of Rwanda. Accept correct examples from the learners.

- Economic activities provide food for the population for example fishing and farming.
- Economic activities provide employment to people. For example, those working in the plantations or factories.
- The sale of products from primary and secondary activities is a source of income to people. This helps to raise the people's standards of living. Products such as milk are sold to the consumers to earn income to the farmers.
- Economic activities such as processing activities are a source of revenue to the government. This revenue is earned through taxation. The revenue is used for the economic development of other areas of the economy.
- Commodities from the economic activities are exported to earn foreign exchange. This revenue is in turn used for economic development of the country.
- The economic activities such as dairy or tea farming have led to the development of transport and communication networks in the rural areas. For example, the construction of roads has led to improved accessibility.
- The economic activities lead

to production of commodities required by people for use. This has enabled people to have access to the basic needs and services. This leads to improved standards of living.

- The primary economic activities are a major source of raw materials for industries.
- Some economic activities such as tea processing and mining have led to the growth of towns.
- Economic activities have led to equitable distribution of goods and services. People who do not produce a commodity are able to get them easily. This is because they can buy the commodities that they do not have in exchange for money or for other goods and services. Services such as banking and insurance come close to the people who need them.

Diagnostic questions

1. Outline the examples of professionals who provide services to people in the country.
2. Name the types of economic activities.
3. Define the term economic activity.

Answers to diagnostic questions

1. Professionals who provide services include teachers, lawyers, bankers, secretaries, journalists, clerks, and medical officers.
2. Types of economic activities.
    - Primary
    - Secondary
    - Tertiary
3. An economic activity is an action that involves the production, distribution and consumption of goods and services.

- **Aeration –** is the process by which air is circulated through, mixed with or dissolved in a substance.
- **Aerosol –** a substance that is released from a container as a spray.
- **Afforestation –** establishment of a forest in an area where there was no forest.
- **Agroforestry –** agriculture that involves cultivation and conservation of trees.
- **Alluvial soils –** fertile soil deposited by water flowing over flood plains or in river beds.
- **Altitude –** the height of an object or point in relation to sea level or ground level.

- **Aquatic –** relating to water, living in or near water.
- **Aquifer –** an underground layer of water-bearing permeable rock.
- **Aspect –** the compass direction that a slope faces.
- **Axis -** an invisible line around which an object such as a planet rotates, or spins.
- **Base –** a substances that is slippery to touch, tastes bitter and changes the color of indicators.
- **Biodiversity –** variety of life in the world.
- **Calibrate –** mark with a standard scale of readings.
- **Canopy –** the cover formed by the leafy upper branches of the trees in a forest.
- **Capillarity –** the process in which a liquid flows in narrow spaces like soil pores.
- **Cartographer –** a person who creates maps.
- **Census –** an official count or survey of a population.
- **Ceramics –** things made of clay and hardened by heat.
- **Chlorofluorocarbon –** a chemical containing atoms of carbon, chlorine, and fluorine. It is mostly used in the manufacture of aerosol sprays.
- **Constriction –** a place where something has become tighter or narrower; an obstruction.
- **Consumption –** using up of a resource.
- **Continental movement –** movement of the earth's continents relative to each other
- **Continents –** part of the earth's crust that rises above the oceans .
- **Convectional currents –** the transfer of heat by the mass movement of heated particles.
- **Coordinates –** each of a group of numbers used to indicate the position of a point, line or plane.
- **Core –** central and innermost part of the earth or other planet.
- **Coriolis effect –** the force that causes a moving object to change direction towards the right in the Northern Hemisphere and the left in the Southern Hemisphere.
- **Cosmic –** relating to the universe.
- **Crest –** the top of a mountain or a hill.
- **Crust –** outer layer of the earth**.**
- **Crystals -** a small piece of a substance that is formed when the substance turns into a solid.
- **Data –** facts and statistics collected together for reference or analysis.
- **Decay –** rotting of organic matter through the action of bacteria or fungi.
- **Decomposition –** the process of rotting.
- **Deflect –** to cause something to change direction.
- **Degree of inclination –** the angle at which a piece of land is raised in relation to a point of reference.
- **Demography –** the study of populations with emphasis on statistics such as births, deaths and income.
- **Density –** the mass per unit volume of a substance .
- **Deploy –** to spread out or arrange strategically.

- **Deposition –** the act or process of depositing.
- **Digital –** electronic technology that generates, stores, and processes data.
- **Dinosaur –** an ancient reptile of enormous size.
- **Disintegration –** the process of breaking into pieces.
- **Drainage –** the process of removing excess water from a substance.
- **Drizzle –** light rain falling in very fine drops.
- **Ecosystem –** a biological community of interacting organisms and their physical environment.
- **Elevation –** the height of a geographical location above or below a point of reference.
- **Emigration –** the act of leaving one's native country with the intent to settle elsewhere.
- **Equatorial trough –** the low atmospheric pressure zone that lies between the subtropical high-pressure belts of the Northern and Southern Hemispheres.
- **Erosion –** Weathering in which surface soil and rock are washed away by the action of glaciers, water, and wind.
- **Exotic –** originating in a distant or foreign country.
- **Extrusive –** relating to rock that has been forced out onto the earth's surface as lava or other volcanic deposits.
- **Farmyard manure –** the traditional manure that is mostly readily available to the farmers. It is made using cow dung, cow urine, waste straw and other dairy wastes.
- **Fauna –** the animals of a particular region.
- **Fieldwork –** practical work conducted by a researcher in the natural environment.
- **Flora –** the plants of a particular region.
- **Foreign exchange –** currency from other countries.
- **Forest reserve –** forests that have been set side and protected by law in a certain country.
- **Fossils –** preserved remains of things of the old times.
- **Gender –** the state of being male or female with reference to social and cultural differences.
- **Geography** – the study of the physical features of the earth and its atmosphere. It also studies human activities as they affect and are affected by the physical features. This includes the distribution of populations and resources, land use, and industries.
- **Glacial –** relating to ice.
- **Granule –** a small grain or particle of something.
- **Gravity –** the force that attracts a body towards the centre of the earth. It can also attract a body towards any other physical body with mass.
- **Green manure –** a fertiliser consisting of growing plants that are plowed back into the soil.
- **Haze –** a slight obscuration of the lower atmosphere, caused by fine suspended particles.
- **Heath –** a short shrub with small leaves and pink or purple bell-shaped flowers.

- **Horizon –** a zone or layer
- **Hydrological cycle –** this is a continuous cycle where water evaporates, into the air and becomes part of the clouds. It then falls down to earth as precipitation and evaporates again. This repeats again and again in a never-ending cycle.
- **Immigration –** the action of coming to live permanently in a foreign country.
- **Impervious –** not allowing fluid to pass through.
- **Infiltrate –** to cause a liquid to enter something like soil through its pores.
- **Inorganic –** not consisting of living matter
- **Insolation –** a measure of solar radiation energy received on a given surface area in a given time.
- **Interstellar gas** – gases, and dust that occupy the space between the stars. It provides the raw material for the formation of new stars.
- **Intrusive –** of or relating to igneous rock that while molten is pushed into cracks or between other layers of rock.
- **Ionosphere –** a part of Earth's atmosphere that has a lot of ions from the solar radiation.
- **Isotope –** a different version of a chemical element.
- **Jovian planets –** outer planets away from the sun.
- **Landform –** a natural feature on the earth's surface.
- **Landscape –** all the visible features of an area of land.
- **Laterally – extending** from side to side.
- **Lava –** hot molten or semi-fluid rock erupted from a volcano or fissure.
- **Lava ejecta –** material ejected out of a volcano such as pumice, ash and tuff.
- **Lava flow –** a mass of flowing or solidified lava.
- **Lay of the land –** the natural features of a geographic area
- **Light years –** The distance that light travels in a vacuum in one year.
- **Loess –** a loamy soil deposit formed by wind.
- **Louvre –** a structure on a roof or window, with side openings for ventilation.
- **Lumbering –** the process of cutting down trees and turning them into timber.
- **Macro-nutrients –** nutrients that provide energy and are required in large amounts.
- **Mafic rocks –** a silicate mineral or rock rich in magnesium and iron that is dark in colour.
- **Magma –** hot fluid or semi- fluid material below or within the earth's crust.
- **Mantle –** a layer in the interior of Earth or another planet.
- **Maritime –** relating to the sea.
- **Matter –** a physical substance that occupies space and has mass.
- **Metamorphism –** alteration of the composition or structure of a rock by heat or pressure.
- **Meteorologist –** scientists who study the atmosphere. They examine its effects on the environment, predict the weather, or investigate climate trends.

- **Micro-climate –** the climate of a small area that is different from the area around it.
- **Micro-nutrients –** nutrients required in small amounts.
- **Micro-organism –** a living organism that is too small to be seen with the naked eye e. g bacteria.
- **Molten –** in a semi-liquid state by means of heating.
- **Moorland –** an area of low-growing vegetation of grass and bushes on acidic soils.
- **Murram –** a form of clay material used for road surfaces.
- **Muslin –** lightweight cotton cloth.
- **Natural resources –** materials or substances that occur in nature and can be used for economic gain. They include forests, fertile land, water, minerals etc.
- **Oblique –** aerial photographs taken from a high point at a slope angle.
- **Oceanic bed –** the bottom of the ocean.
- **Offshore –** situated at sea some distance from the shore.
- **Onshore –** situated or occurring on land.
- **Organic –** relating to or derived from living matter.
- **Organic farming –** a form of agriculture that depends on techniques like crop rotation, green manure, compost and biological pest control.
- **Orographic –** resulting from the effects of mountains.
- **Oxides –** a mixture of oxygen and another element.
- **Ozone layer –** a layer in Earth's stratosphere that absorbs most of the ultraviolet radiation reaching Earth from the sun.
- **Ped –** a soil particle.
- **Percolate –** of a liquid; filter gradually through a porous surface or substance.
- **Perennial –** lasting or existing for a long time.
- **Permeability –** the state of a material that causes it to allow liquids or gases to pass through it.
- **Photosynthesis –** a process used by plants to convert light energy from the sun, into chemical energy that can be later released to fuel the plant's activities.
- **Physical features** – the environment: landforms, water bodies, climate, natural vegetation and soils of the earth.
- **Planetoid –** minor planet
- **Plankton –** the small and microscopic organisms drifting or floating in the sea or fresh water.
- **Plutonic –** igneous rock formed by solidification below the earth's surface.
- **Population pyramid –** a graphical illustration that shows the distribution of various age groups in a population.
- **Porous –** relating to a rock having spaces or holes through which liquid or air may pass.
- **Precipitate –** cause (a substance) to be deposited in solid form from a solution.
- **Pressure belt** – A pressure belt is a band of high and low pressure found every 30 degrees.

- **Quarrying –** extraction of stones from rocks on the ground.
- **Rain shadow –** a region with little rainfall because it is sheltered from rain-bearing winds.
- **Ratio –** a relationship between two quantities showing the number of times one value is contained another.
- **Raw materials –** a basic material that is used to produce goods, finished products and energy.
- **Reforestation –** restocking of existing forests that have been depleted or destroyed.
- **Refugee –** a person who has been forced to leave their country in order to escape war, persecution or natural disaster.
- **Regolith –** the layer of loose material covering the bedrock of the earth.
- **Relief –** the highest and lowest elevation points in an area. Mountains and ridges are the highest elevation points, while valleys are the lowest.
- **Revenue –** a country's income from which public expenses are met.
- **Ribbon –** a long narrow strip of something.
- **Run-off –** draining away of water from the land surface.
- **Satellite** – a body that orbits around Earth, any other planet or a star.
- **Scarp –** a very steep bank or slope.
- **Sea level –** an average level for the surface of the earth's oceans from which heights are measured.
- **Sea waves –** a disturbance on the surface of the sea or lake. It is usually in the form of a moving ridge or swell.
- **Sediments –** solid fragments of inorganic or organic material that settle at the bottom of lakes or ocean beds. They are carried and deposited by wind, water, or ice.
- **Sediments –** the accumulation of sand and dirt that settles at the bottom of lakes or oceans.
- **Semi-processed –** a product that has not been fully processed to completion to create a product.
- **Sensitise –** make an object or substance sensitive to light.
- **Slide –** an image on a transparent base for projection on a screen.
- **Soil aggregate –** groups of soil particles that bind to each other strongly.
- **Solidification –** to make something into a hard compact mass or a solid.
- **Soluble –** of a substance able to dissolve in water.
- **Sub-surface water –** water beneath earth's surface as part of the water cycle.
- **Sublimation –** a chemical process

Glossary

where a solid turns into a gas without going through a liquid stage.

- **Submarine canyons –** is a steep-sided valley cut into the sea floor .
- **Tectonic plate movement –** theory which states that the Earth's lithosphere is divided plates that float over the mantle.
- **Terrain –** a tract of land considered with its physical features.
- **Terrestrial planets –** inner planets closer to the sun.
- **Tillage –** preparation of land for growing crops.
- **Topographical map** – a detailed, accurate graphic representation of features that appear on the earth's surface.
- **Transverse –** extending across something.
- **Tributaries –** rivers or streams flowing into a larger river or lake.
- **Tsunami –** very large ocean wave caused by an underwater earthquake or volcanic eruption.
- **Twilight –** the soft light from the sky when the sun is below the horizon. It usually occurs at daybreak to sunrise or from sunset to nightfall.
- **Ultra-violet –** electromagnetic radiation.
- **Undulating –** to have a wavy shape that rises and falls such as in hills and valleys.
- **Vacuum –** empty space.
- **Volcanic lava –** the molten rock expelled by a volcano during an eruption.
- **Vulcanicity –** the process through which gases and molten rock are forced out onto the earth's surface or into the earth's crust.
- **Waterlogged –** saturated with or full of water.
- **Watershed –** a ridge of high land dividing two areas that are drained by different river system.
- **Zone –** an area distinguished from other parts by a distinct feature or characteristic.