South Sudan

Secondary Geography 2

Secondary Geogr aphy for Secondary Schools has been written and developed by the Ministry of General Education and Instruction, The Government of South Sudan in conjunction with Subjects experts. This course book provides a fun and practical approach to the subject of Geography, and at the same time imparting life long skills to the students.
The book comprehensively covers the Secondary 2 syllabus as developed by Ministry of General Education and Instruction.

Each year comprises of a student's Book and a teacher's Guide.

The Teacher's guide provide:

- Full coverage of the national secondary school syllabus.
- A strong grounding in the basics of how to teach Geography as a subject, inclusive of helpful detailed notes.
- Clear presentation and explanation of Geographical concepts, theories and ideas
- Answers to a variety of case studies, progress checks, comprehensive activities and exercises, often showing how Geography can be applied to tackle real-life situations.
- It provides opportunities for collaboration through group work activities.
- Clear, detailed and stimulating illustrations.

All the courses in this Secondary series were developed by the Ministry of General Education and Instruction, Republic of South Sudan. The books have been designed to meet the Secondary school syllabus, and at the same time equiping the pupils with skills to fit in the modern day global society.

Funded by:

GLOBAL PARTNERSHIP for EDUCATION
quality education for all children

South Sudan

Secondary Geography 2

Teacher's Guide

Secondary Geography 2

This Book is the Property of the Ministry of General Education and Instruction.

This Book is not for sale.

Funded by:

GLOBAL PARTNERSHIP for EDUCATION
quality education for all children

How to take care of your books.

Do's

1. **Please cover with plastic or paper. (old newspaper or magazines)**
2. **Please make sure you have clean hands before you use your book.**
3. **Always use a book marker do not fold the pages.**
4. **If the book is damaged please repair it as quickly as possible.**
5. **Be careful who you lend your schoolbook to.**
6. **Please keep the book in a dry place.**
7. **When you lose your book please report it immediately to your teacher.**

Don'ts

1. **Do not write on the book cover or inside pages.**
2. **Do not cut pictures out of the book.**
3. **Do not tear pages out of the book.**
4. **Do not leave the book open and face down.**
5. **Do not use pens, pencils or something thick as a book mark.**
6. **Do not force your book into your schoolbag when it is full.**
7. **Do not use your book as an umbrella for the sun or rain.**
8. **Do not use your book as a seat.**

South Sudan

SECONDARY 2

Geography

Teacher's Guide

This book is the property of the Ministry of Education and General Instruction.

THIS BOOK IS NOT FOR SALE

GLOBAL PARTNERSHIP for EDUCATION
quality education for all children

FOREWORD

I am delighted to present to you this Teacher's Guide, which is developed by the Ministry of General Education and Instruction based on the new South Sudan National Curriculum. The National Curriculum is a learner-centered curriculum that aims to meet the needs and aspirations of the new nation. In particular, it aims to develop (a) Good citizens; (b) successful lifelong learners; (c) creative, active and productive individuals; and (d) Environmentally responsible members of our society. This textbook, like many others, has been designed to contribute to achievement of these noble aims. It has been revised thoroughly by our Subject Panels, is deemed to be fit for the purpose and has been recommended to me for approval. Therefore, I hereby grant my approval. This Teacher's Guide shall be used to facilitate learning for learners in all schools of the Republic of South Sudan, except international schools, with effect from 4th February, 2019.

I am deeply grateful to the staff of the Ministry of General Education and Instruction, especially Mr Michael Lopuke Lotyam Longolio, the Undersecretary of the Ministry, the staff of the Curriculum Development Centre, under the supervision of Mr Omot Okony Olok, the Director General for Quality Assurance and Standards, the Subject Panelists, the Curriculum Foundation (UK), under the able leadership of Dr Brian Male, for providing professional guidance throughout the process of the development of National Curriculum, school textbooks and Teachers' Guides for the Republic of South Sudan since 2013. I wish to thank UNICEF South Sudan for managing the project funded by the Global Partnership in Education so well and funding the development of the National Curriculum, the new textbooks and Teachers' Guides. I am equally grateful for the support provided by Mr Tony Calderbank, the former Country Director of the British Council, South Sudan; Sir Richard Arden, Senior Education Advisor of DfID, South Sudan. I thank Longhorn and Mountain Top publishers in Kenya for working closely with the Ministry, the Subject Panels, UNICEF and the Curriculum Foundation UK to write the new textbooks. Finally, I thank the former Ministers of Education, Hon. Joseph Ukel Abango and Hon. Dr John Gai Nyuot Yoh, for supporting me, in my role as the Undersecretary, to lead the Technical Committee to develop and complete the consultations on the new National Curriculum Framework by 29 November 2013.

The Ministry of General Education and Instruction, Republic of South Sudan, is most grateful to all these key stakeholders for their overwhelming support to the design and development of this historic South Sudan National Curriculum. This historic reform in South Sudan's education system is intended to benefit the people of South Sudan, especially the children and youth and the future generations. It shall enhance the quality of education in the country to promote peace, justice, liberty and prosperity for all. I urge all Teachers to put this textbook to good use.

May God bless South Sudan. May He help our Teachers to inspire, educate and transform the lives of all the children and youth of South Sudan.

Deng Deng Hoc Yai, (Hon.)

Minister of General Education and Instruction, Republic of South Sudan

TABLE OF CONTENTS

Guide to teaching Secondary school learners

Learning for secondary school learners is basically acquired through listening, reading, writing, creative and imaginative activities. It is through these activities that learners enhance various aspects of development which include: physical, cognitive, language, social, moral, spiritual, emotional, cultural and aesthetic.

It is imperative for teachers to realize that individual differences should be put into consideration when organizing activities for secondary school learners. This is in relation to their abilities, capabilities and potentialities.

This guide book provides hints for the teacher in relation to the activities learners can perform in order to cover specific content. Teachers are advised not to consider the hints suggested to be exhaustive. They are instead expected to be creative and come up with more activities which can make learning more interesting for the learners.

It is important for teachers to note that the activities suggested for a specific content area varies in the level of complexity as we move from one level to another. The aspect is meant to cater for the development age levels of learners in terms of their abilities and capabilities.

Notes to the teacher

The significance of using the teacher's guide

The guide will help you to:

1. Outline the specific objectives in the themes and sub-themes to be taught.
2. Plan for the daily lessons geared towards achieving the targets for the whole term/ semester.
3. Identify and choose teaching and learning methods that will facilitate the achievement of the outlined objectives.
4. Prepare simulating environments to enhance the teaching / learning experience.
5. Select and ensure that the teaching / learning resources are suitable and available for teaching a given theme.
6. Assess the progress of the learner by using appropriate assessment methods.

Why teach Geography in Schools?

Geography in secondary schools is important for learners to acquire knowledge about the distribution of world's physical features and their impacts on human activities. Geography appreciates the diversity in nature and tries to grant learners with knowledge on how physical features are formed. Similarly they also learn how human activities contribute to change in climate and issues like environmental degradation among others.

As a career subject, geography has vast areas of specialization in the job industry giving the student a wide array of choices for his/her future aspirations. Examples of careers that learners may benefit from geography include aviation, meteorology, survey, tour guide among others.

Geography is an interesting subject to teach and teachers should ensure that the lessons are adventurous, lively and interactive by encouraging participation of the learners in the classroom.

Components of the book

A summary of the contents in the course book and the teacher's guide

The student's course book contains 8 broad units, each with a varied number of detailed topics. The book also contains a variety of numbered exercises, comprehensive activities, creative and cases studies to assess the understanding of the student. The activities and the case studies are group centered hence making the subject interactive based. They also help the student understand the various units within the book by upholding practicability.

The teacher's guide contains all detailed teaching notes on the 8 units and the topics within them. It also has the answers for the case studies, exercises and activities.

The guide also has *themes* spread over the 8 broad Units which are:

1. Learning objectives,
2. Learning outcomes,
3. Key competencies to be developed,
4. Cross- cutting issues,
5. Link to other subjects,
6. Gender equality and sensitivity and
7. Attention to special need education.

Note: The content maps are represented as a comprehensive summary of the eight units before the detailed subtopics. This helps the teacher note the needs of the units in relation to the curriculum/ syllabus before embarking on the lessons.

For an effective learning experience, the teacher should ensure that the learners have a copies of the student's course book, maps, atlases and a geometrical set.

Handling units within the book

Each unit has materials that intend to develop the learner's understanding of Geography. The course book also aims to develop creativity and interaction of the learner with people around them.

Learners will reach understanding through observation, listening and action before they can embark on listening and reading. The course book contains **a varied number of comprehensive, creative activities** and a number of **case studies** that foster more on working in pairs, engaging in debates and group works, making the experience interesting, meaningful, adventurous and fun.

The teacher should use the notes provided in the teacher's guide as a supplement for his/ her teaching. He or she should gather all information on the topic and write short notes to be used during the various individual lessons.

It is the responsibility of the teacher to encourage individual responses for the work done in class to develop religious competency of each learner in the classroom set up.

Useful methods or strategies for teaching the Geography course

DISCUSSION

A discussion is having a talk about something with others.

Points to note about a discussion:

- Learners should talk more than the teacher.
- A discussion will be effective if there is good discipline in the class.
- Learners should be taught to talk one at a time.
- They should be taught to listen to each other.
- The teacher should remember to be a good chair person.
- The teacher should make sure that the learners learn the message in the discussion.

- A summary should be made at the end of the discussion of what the learners have said.
- It may be necessary to divide the learners in smaller groups. In such case, the teacher should appoint or get the groups to appoint a chairperson who will report back to the whole class later.

A discussion can be started in the following ways:

- Using an illustration.
- Describing a situation.
- Asking learners to describe situations they have experienced.

A discussion can be held:

- After an activity.
- After a role play or a drama.

BRAINSTORMING

Brainstorming is the name given to any discussion during which people progress their ideas freely. Brainstorming is a way of listing as many solutions as possible in a short period of time. All the ideas offered should be accepted and written down. No criticism or evaluative comments should be made.

Brainstorming is an important part of learning/ teaching creative thinking. It allows learners to work together to create ideas. It also has a place in decision making as it helps to increase the range of factors taken into account in reaching a decision. There should be no criticism in the ideas suggested. On the other hand ideas that seem wild or outrageous should not be discouraged. Similarly, new ideas may result from combining or building on previous ideas.

GROUP WORK

Group work is one of the solutions to effective handling of large classes which teachers may often be faced with. The extent to which the teachers work with their classes or with individuals or groups affect the kind of contact they have with each learners. Group work is appropriate for the following reasons:

i. So that work can be provided at a suitable level for learners of similar abilities.
ii. So that cooperation and independence can be developed in learners.
iii. So that group discussion and interaction can be generated. Learners learn from their interaction with one another as much as they do from their interactions with the teacher.
iv. To make better use of limited materials.
v. It is less easy for a student to "opt out" that in a whole situation.

Types of groups:

- *Ability groups:* These are useful where the work provide is of different levels to suit the stage of development of the learners in each group. They might be in the fast group in some topics or subtopics and in the average or slower groups. Avoid referring to the groups in such a way that suggest ability rating.
- *Mixed ability groups*: these are carefully chosen so that brighter learners can aid slower learners.
- *Friendship groups:* they are chosen by learners themselves. These however, can, if not handled carefully, result in all girls or all boys groups which may not be desirable. Also there is always a learners who is not wanted in any group.
- *Random groups:* these are chosen by the teacher on the spot. Probably the best method is to have a variety of different types of groups in different situations. This also help to create interest for the Learners rather than keeping them in the same group throughout.

BEGINNING GROUP WORK

It is observable, especially at the outset, that even when the learners are set to work in groups, they often work as individuals. It is very rare to find learners working harmoniously as a group. It is therefore useful to remember that learners need to be trained to work as a group. They need to have a practice in sharing, listening to others, points of view and contributing to common goals. This often needs constant hard work and positive reinforcements for the teacher.

DOs and DON'Ts of group works

DOs	DON'Ts
a) Give your groups names. b) Appoint reliable group leaders. c) Have group monitors responsible for collecting and returning materials if any. d) Make provisions for "messy" activities by providing newspaper covering, clothes and water for cleaning up. e) Make sure that learners are clear about what they are going to do before they begin. f) Have eyes on the back of your head g) Move around from group to group.	a) Give out materials before learners are ready to begin. b) Overemphasize the aspect of competition since this discourages co-operation. c) Stand with your back to other groups when taking in any particular groups. d) Be too fussy about noise provided it is reasonable and to the point of the lesson.

Field work

Participating in field activities is important in understanding geography. Observing the natural landscape and applying whatever they have taught is paramount.

Field trips enhance practicability as a tool in understanding geography. It is advisable for the teacher to liaise with the school's administration or any other authority within the school to make sure that the learners take a visit to a nearby national park or game reserve to engage themselves in activities within the book.

The teacher should also communicate with the parents and explain the importance of field work to the academic progress of the student.

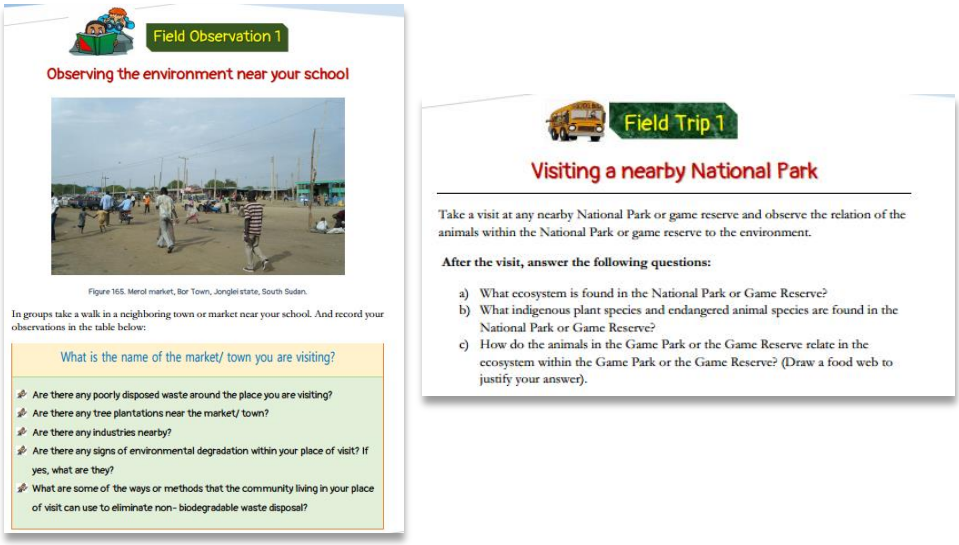
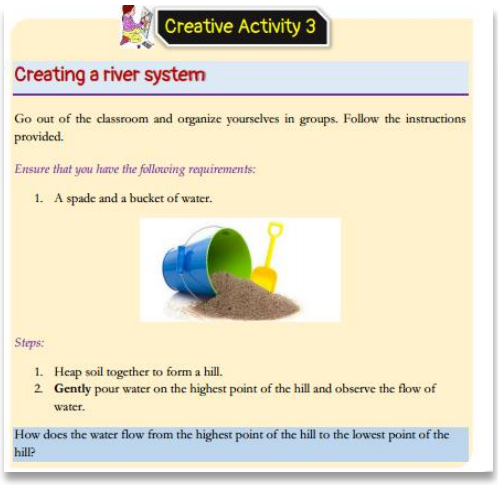


Figure 1. Field work opportunities within the student's book

Note: Adequate preparations before the field trip is important to ensure that all stakeholders participating in the academic trip are well catered for. If possible the learners may engage in field work activities, however in cases where there could be problems related to accessing the areas of visit (as indicated in the activities) the teacher should come up with activities to substitute the fieldwork. The activities should relate with the topic.

Assessment opportunities within the Student's book


Creative Activity 3

Creating a river system

Go out of the classroom and organize yourselves in groups. Follow the instructions provided.

Ensure that you have the following requirements:

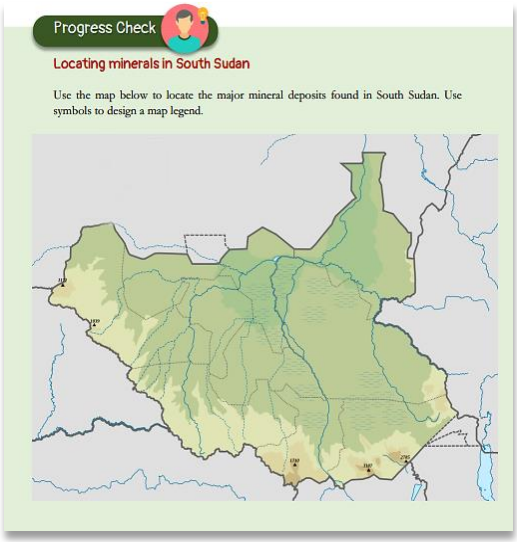
1. A spade and a bucket of water.

Steps:

1. Heap soil together to form a hill.
2. **Gently** pour water on the highest point of the hill and observe the flow of water.

How does the water flow from the highest point of the hill to the lowest point of the hill?

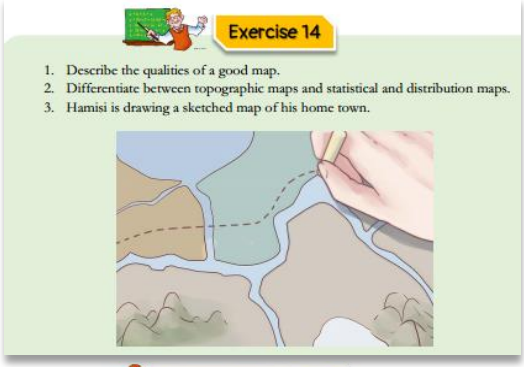
These activities encourage creativity within lessons.


Progress Check

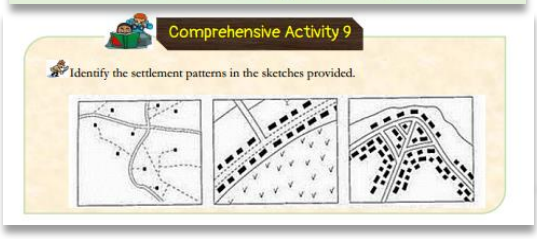
Locating minerals in South Sudan

Use the map below to locate the major mineral deposits found in South Sudan. Use symbols to design a map legend.

Progress checks are tasks specifically designed to help the teacher provide a break during lessons. They focus more on nurturing critical and creative thinking.


Exercise 14

1. Describe the qualities of a good map.
2. Differentiate between topographic maps and statistical and distribution maps.
3. Hamisi is drawing a sketched map of his home town.

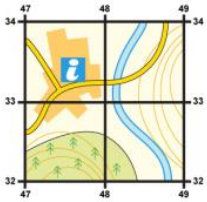

Comprehensive Activity 9

Identify the settlement patterns in the sketches provided.

Exercises and comprehensive activities are tools to gauge the knowledge and understanding of the student on various concepts

Practical activity: Reading grid lines

Four-figure grid references can be used to pinpoint a location to within a square measuring 1 sq. km.



To find the grid reference of the tourist information office within the map represented with the symbol ( ):

1. Start at the left-hand side of the map and go east until you get to the easting crossing through the bottom-left-hand corner of the square you want. Write this number down.
2. Move north until you get to the northing crossing the bottom-left-hand corner of the square you want. Look at the number of this grid line and add it to the two-digit number you already have. This is your four-figure grid reference. In this case, the tourist information office is in grid square 4733.

Sometimes it is necessary to be even more accurate. In this case you can imagine that each grid is divided into 100 tiny squares. The distance between one grid line and the next is divided into tenths.

1. First, find the four-figure grid reference but leave a space after the first two digits. When you get to the easting at the left-hand side of the grid square you want, keep moving east and estimate or measure how many tenths across your symbol lies. Write this number after the first two digits.

Practical activities come in handy especially in photography and map reading sections.

Case study 3

Look at the picture below and answer the questions that follow:

- Is there any river near your home or school?
- Based on what you know describe some of the dangers that may occur in rivers?
- What are the advantages of rivers in relation to human activities?

Case studies are investigative tasks that apply theories and concepts into real life contexts. They enhance the students' understanding through collaboration

Remember...

- On an Ordinance Survey map **each grid square** is 1 km x 1 km or **1 sq. km.**
- When you give a grid reference, always give the easting first... **"Along the corridor and up the stairs".**

These are sections within the book to help the student recall key concepts with ease.

Unit 1: The Physical Features of South Sudan

Number of topics

24 topics

Approximated number of lessons

4-8 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners should use a range of resources to identify and describe the physical features of South Sudan (e.g. rivers, valleys, mountains, lakes, escarpments etc.) by using a variety of tools such as atlases, photographs, books and map extracts within the course book among others. They should explore, investigate and understand the physical and chemical processes leading to the formation of these features e.g. volcanicity, Vulcanicity, folding and faulting. They should work collectively to compare these features to contrasting areas such as North America, Europe, and Asia etc. and value the importance of these features to South Sudan.

They should explain and analyze the influence of these various features in determining human activities in South Sudan.

Knowledge and understanding

- Identify and describe the physical features of South Sudan.
- Describe the processes leading to their formation.
- Compare these features to contrasting areas/ regions.
- Explain the influence of these various features on South Sudan.

Key Inquiry questions

a) What type of physical features are found in South Sudan?
b) How do you describe these features?
c) What do you understand the processes leading to their formation?
d) How do you relate these features to other areas/ regions?
e) What are the importance of these physical features to South Sudan?

Skills to be acquired

- Exploring a variety of different features and understanding their formation and distribution in South Sudan and other contrasting areas.
- Ability to classify these features and investigate the process leading to their formations.
- Investigate different features of South Sudan and other countries.

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in drawing, naming and classifying parts of the various geographical features.

Attitudes

- Appreciating the variety of physical geographical features within South Sudan.

Link to other subjects

Environment and sustainability: impact of physical geographical features in a region

Describing Physical features

There are four major procedures of describing physical features. They include:

1. Describing the processes that lead to their formation.
2. Classification of the physical features.
3. Types of the physical features.
4. Locating the various physical features in maps and atlases.

The teacher should guide the learners in describing the various physical features using the steps above.

Similarly the teacher should as well explain to the learners on the impact of these physical features *(advantages and disadvantages)* to human activities which include:

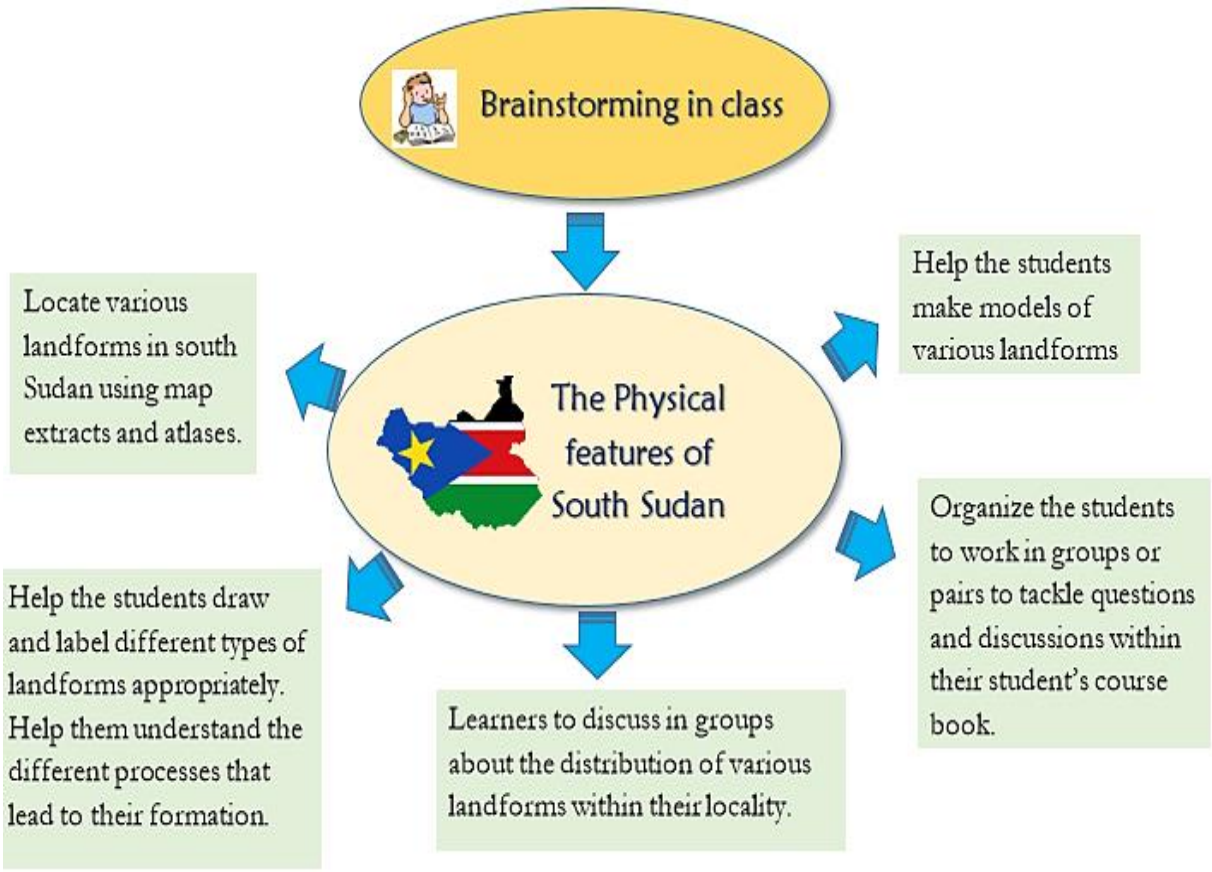
a) Agriculture.
b) Mining.
c) Tourism and trade.
d) Human settlement.
e) Fishing.

Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Creative activities in the book are paramount for the student to understand the different topics practically before the actual lesson. Ensure that the class has all the materials needed. Organize the learners in random groups.

Brainstorming

As described earlier, brainstorming can be an effective method of teaching. Brainstorming allows learners to work together in creating ideas. The teacher is supposed to start the lesson with a brainstorming question to ignite the comprehension of the learner. Use the following information:



Resources required in this unit

Generally, the teacher is supposed to ensure even distribution of the student's course book within the classroom. For an effective learning experience, the following resources should be provided to the learners in order to cover the various subtopics, activities and exercises provided within the student's course book. Liaise with the school's authority for the provision of these items. If not possible, come up with alternative creative activities which based on the topic coverage.

Subtopic	Requirements
Formation of landforms (volcanic Mountains – Creative Activity 1: Pg. 2-3 of the student's course book	Clay or plastacine, small plastic bottles, Vinegar, Baking soda and trays enough for the number of groups created.
Formation of fold mountains- creative activity 2 Pg. 14	Sheets of paper
Making a model of a river system- Creative activity 3 Page 27	A spade and a bucket of water.
Mountains and Hills of South Sudan Pg. 23-25	Copies of atlases and map extracts.

Creative activity 1 (pg. 2-3)

Making a volcanic mountain

Organize the learners into groups. Ensure that all the groups has all the materials needed. Guide the learners to follow the steps given in the student's course book. Appoint a leader in each group to be responsible for the collection and returning of the materials after the activity/ experiment. The leader should ensure that his/ her group members clean their area of work.

Answers

Comprehensive Activity 1 Pg. 12

1. Ash cloud
2. Volcanic bombs
3. Volcanic ash.
4. Crater
5. Rocks
6. Lava flow
7. Pyroclastic material
8. Earth's crust.
9. Side vent.
10. Main vent.
11. Magma chamber.
12. Parasitic/side cone.

Case study 1 (pg. 12)

Impacts of volcanic mountains on human activities (group presentation)

Impact of volcanic mountains to human activities

Advantages of volcanic mountains

a) Volcanic rocks after weathering result into formation of very fertile soils hence encourage agriculture.
b) Vulcanicity helps in formation of valuable minerals like diamond, gold, silver.
c) Vulcanicity leads to formation of geysers which are sources of geothermal electricity which help in domestic and industrial use.
d) Vulcanicity result into formation of many features acting as tourist attraction hence foreign exchange: crater lakes, volcanic mountains, geysers.
e) Volcanic mountains facilitate moderation of climate and receive high rainfall than flat areas.
f) Fishing is likely to be found in crater lakes.
g) Igneous rocks are used for construction of roads, houses, bridges, etc.

Disadvantages of volcanic mountains

a) Volcano eruption results into loss of lives and properties.
b) Some weathered volcanic materials like ashes and granite can result into infertile soils.

c) Some volcanic features create barriers making construction of communication lines difficult and expensive.
d) Rugged nature of some volcanic landscapes discourages economic activities such as agriculture.
e) The lee-ward sides of volcanic mountain create a rain shadow that is these part of the mountain doesn't receive equal amount of rainfall like the windward side. At times it doesn't receive rain at all.

Exercise 1 Pg. 13

1. *Vulcanicity:* is the processes by which molten materials from the mantle (magma) are intruded into the Earth's crust but also extruded from the crust while *Volcanicity:* Refers to the ways by which magma is intruded into the earth's crust.
2. *Intrusive/Plutonic volcanicity*: this is when magma is forced into the earth's crust where it solidifies into a range of features that are often exposed at the surface by later erosion. On the other hand, *extrusive volcanicity* refers to when volcanic activity takes place above ground, so that hot molten magma is released onto the landscape.
3. **How volcanic mountains are formed:**

   Deep inside Earth, between the molten iron core and the thin crust at the surface, there is a solid body of rock called the mantle. When rock from the mantle melts, moves to the surface through the crust, and releases pent-up gases, volcanoes erupt. Extremely high temperature and pressure cause the rock to melt and become liquid rock or magma. When a large body of magma has formed, it rises through the denser rock layers toward Earth's surface. Magma that has reached the surface is called lava. Lava then cools down and forms various volcanic structures. Along with molten rock, volcanic ash and other gases are also introduced into the Earth's atmosphere during a volcanic eruption. When this volcanic material comes to the surface of the Earth, it settles along the vent wherein it cools over the course of time, and eventually results in the formation of a mountain. While the entire process seems pretty simple, it takes several thousands of years and numerous layers of solidified lava for the formation of volcanic mountains.
4. **Types of volcanoes:**
   a) Acid lava domes.
   b) Basic larva domes/ shield volcanoes.
   c) Acid and cinder cones.

5. **Using the map given below, research and come up with a list of the world's most violent and dormant volcanoes.** The teacher is supposed to provide reading materials to the students. Preferably organize a library session where students can be able to come up with researched information as asked in the question above.
6. **Classification of volcanoes:**
    a) *Active volcano:* these are volcanoes known to have erupted in recent times e.g., Jebel Marra in Sudan, Ol donyo Lengai in Tanzania and Mt. Cameroon.
    b) *Dormant volcano:* these are volcanoes known to have erupted in the recent past but show signs of volcanic activity such as presence of hot springs, geysers and fumaroles e.g. Mt.Kilimanjaro, Longonot and Menengai of Kenya.
    c) *Extinct volcano:* these are volcanoes that have not shown signs of possible future eruptions e.g. Mountains Kenya and Elgon

Creative activity 2 (Pg. 17)

Making a fold mountain

Organize the learners into groups. Ensure that all the groups has all the materials needed. Guide the learners to follow the steps given in the student's course book.

Comprehensive Activity 2 Pg. 17

1. *Types of folds:*
    a) Symmetrical folds.
    b) Asymmetrical folds.
    c) Isoclinal folds.
    d) Recumbent folds.

Case study 2 (pg. 18)

Impact of fold mountains on human activities (group presentation)

Impacts of Fold Mountains on human activities:

a) Some fold mountains have exposed valuable mineral deposits which are exploited.
b) Snow covered slopes encourage sporting activities.
c) The topographical nature of the landscape may encourage or discourage settlement and agriculture.
d) Fold Mountains may hinder transport, communication and construction.
e) Fold Mountains are important tourist attractions.
f) They trap rainfall which feed rivers.
g) The windward slopes off Fold Mountains receive heavy rainfall which enhance agriculture and forestry.

Exercise 2 Pg. 18

1. *Describing the process of folding:*
   Folded Mountains happen when there is a pushing together of part of the earth's crust from the ends, causing it to fold and ripple in the middle. The same phenomenon can be seen if you push the ends of a rug together; it ripples in the center. The convergence of the earth's crust lifts the earth to form an *anticline* (the rising part of a fold mountain) and a *syncline* (the valley like feature of the fold mountain).
2. *Definition of terms:*
   a) *Anticline:* the rising part of a fold mountain.
   b) *Syncline*: the valley like feature of the fold mountain.

c) *Axial planes:* The axial plane of a fold is the plane or surface that divides the fold as symmetrically as possible. The axial plane may be vertical, horizontal, or inclined at any intermediate angle.

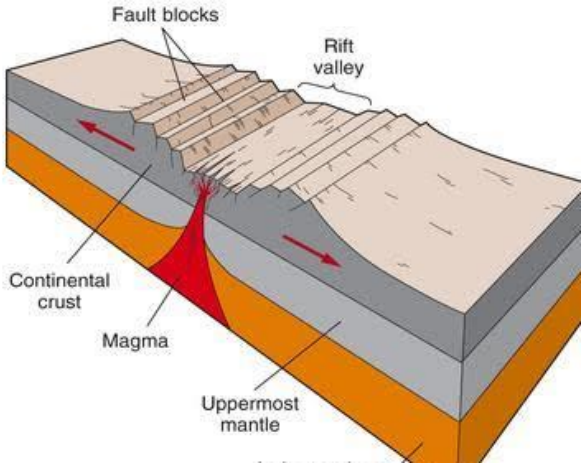
d) *Axis:* A line which lies parallel to the hinge line and marks the intersection of the axial plane with the hinge zone.

e) *Monocline folds:* This type of fold is characterized by local warping in horizontal strata. Rock beds lying at two level separated by steep inclined limbs. It is form by vertical movement and generally found fault below monocline. A step-like fold in rock strata consisting of a zone of steeper dip within an otherwise horizontal or gently-dipping sequence.

f) *Recumbent folds:* A recumbent fold has an essentially horizontal axial plane. Linear, fold axial plane oriented at low angle resulting in overturned strata in one limb of the fold.

g) *Isoclinal folds:* Isoclinal folds are similar to symmetrical folds, but these folds both have the same angle and are parallel to each other. 'Iso' means 'the same' (symmetrical), and 'cline' means 'angle,' so this name literally means 'same angle.' So isoclinal folds are both symmetrical and aligned in a parallel fashion.

Comprehensive Activity 3 Pg. 21



Exercise 3 Pg. 22

1. *Differentiating between folding and faulting:*

   Faulting is the process where crustal rocks are fractured due to tensional/compressional movement caused by the endogenetic forces, along a plane called the *fault plane*. The movement responsible for the formation of a fault may operate in vertical, horizontal or any other direction. *Folding* on the other hand involves pushing together of part of the earth's crust from the ends, causing it to fold and ripple in the middle. The same phenomenon can be seen if you push the ends of a rug together; it ripples in the center. The convergence of the earth's crust lifts the earth to form an anticline (the rising part of a fold mountain) and a syncline (the valley like feature of the fold mountain).

2. *Definition of terms:*

   a) *Horst:* a raised elongated block of the earth's crust lying between two faults.

   b) *Fault:* a fracture in the earth's crust resulting in the relative displacement and loss of continuity of the rocks on either side of it.

   c) *Escarpment:* a long, precipitous, cliff like ridge of land, rock, or the like, commonly formed by faulting or fracturing of the earth's crust.

   d) *Tension and compressional forces:* tension force is a force that tends to stretch or elongate something while compressional force is a force that tends to shorten or squeeze something, decreasing its volume.

   e) *Normal fault:* A fault caused by tension is called and the displacement of the two faulted blocks is away from each other.

   f) *Reverse fault:* a fault caused by compressional forces and the movement of the fractured blocks is *towards* each other. Reverse faults are also called thrust faults.

   g) *Shear fault:* fault caused by shearing forces (i.e. the forces are not along the same axis, but are parallel).

3. *Formation of block mountains/ horst and rift valleys/ grabens*

   Block Mountains are formed when a movement in the earth's crust forces the rocks to break. As a result, enormous cracks or faults are formed when sets of faults run parallel to each other and the ground between is forced up, a block

mountain also known as a horst is formed. Example of Block Mountains are the Usambara, Uruguru and Ruwenzori mountains in East Africa.

Other features associated with faulting and Block Mountains are *rift valleys or grabens.* Rift valleys are formed when the land is between two sets of faults sink down. The Great East African Rift valley is the longest in the world. It stretches from the Baka's valley east of the Lebanon Mountains, through the Red sea, Ethiopia, East Africa to the lower Zambezi Area. A branch of the valley runs along Lake Tanganyika in Tanzania to Lake Albert in Uganda.

Comprehensive Activity 4 Pg. 26

1. *Arranging mountains in order:*
    a) Imatong Mountain ranges, south east of South Sudan with mount Kinyeti as the highest with a height of 3000m above sea level.
    b) Mount Lotuke located in eastern Equatoria, South Sudan with an elevation of 2795m above sea level.
    c) Dongotana Mountains, Southwest of Emogadong and North of Aripewi and Toghogha, South Sudan with and elevation of 2213m above sea level.

2. *Other mountains in South Sudan:* Mount Itibol, Mount Garia, Mount Kamia, Mount Isubhak, Lopit Hills, Didinga hills, Mount Isubhak, and Mount Konoro among others.
3. The students are supposed to pinpoint the location of major mountains of South Sudan on the map provided on page 25. Alternatively, the teacher can as well guide them in drawing a sketch map of South Sudan from which they can pin point the nation's mountains and hills using small triangles with information on their altitude.

Describing water bodies (formation and examples)

This topic focuses more on the formation of rivers and lakes. The teacher is supposed to use all the resources available (creative activities, notes, comprehensive activities and case studies) to make learners comprehend the lessons within the topic.

Before the lesson, use the learners' course book to get a clue on what is required during the lessons.

Creative activity 3 (Pg. 27)

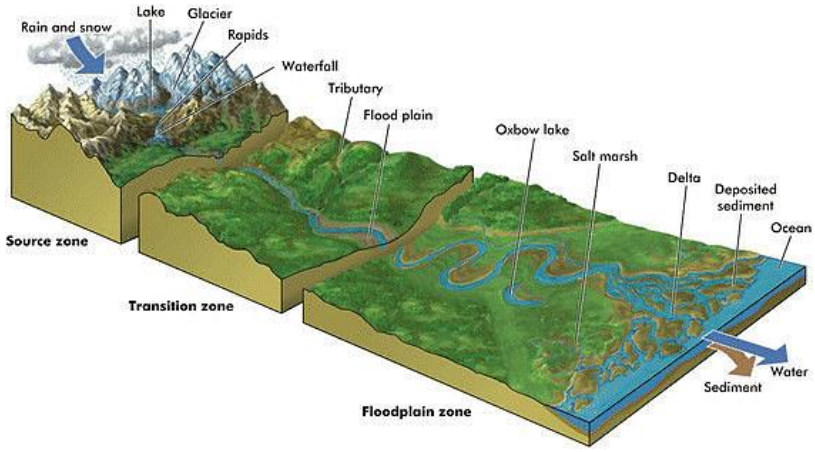
Creating a river system

The teacher is supposed to take his/her learners out of the class room and do the following:

a) Organize the learners into groups.

b) Ensure that all the groups has all the materials needed. Guide the learners to follow the steps given in the student's course book. During the experiment, explain the relation of the activity to the lesson i.e. *how a river system is formed from the source to the mouth.*

c) Appoint a leader in each group to be responsible for the collection and returning of the materials after the activity/ experiment.



Case study 3 Pg. 35

Impact of rivers on human activities (group presentation)

Uses and Advantages of rivers.

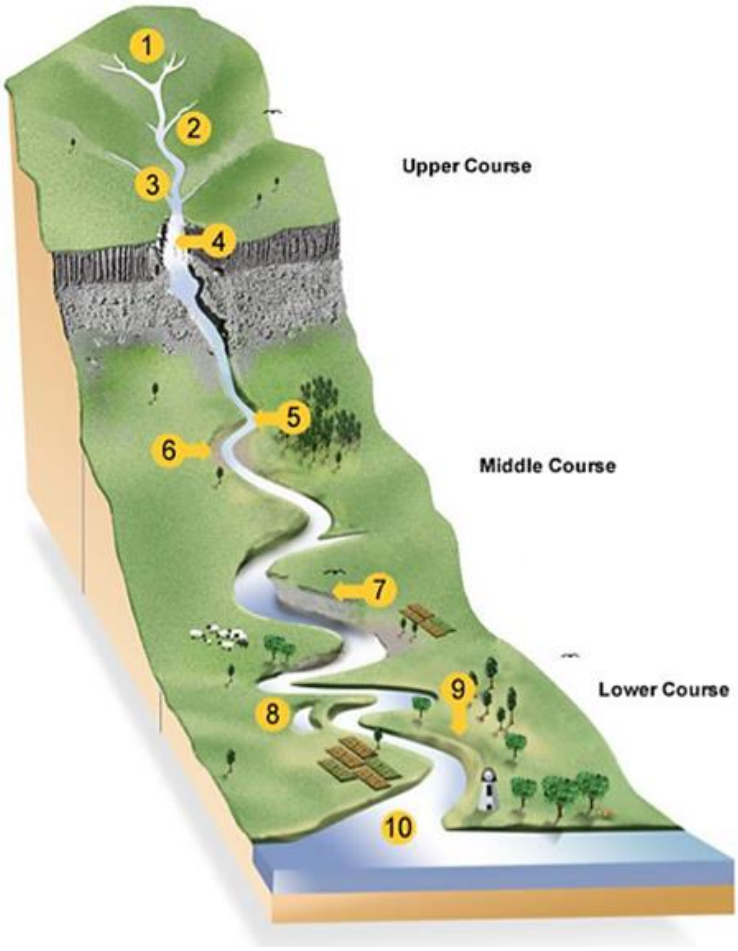
1. Rivers acts as scenic attraction to a region. They are also a habitat for fish and other forms of wildlife.
2. They offer Leisure/Sport/Recreation activities for instance fishing, canoeing, and cruising.
3. People may use rivers as a channel of transport.
4. They are a major source of water to both humans and animals.
5. Rivers form waterfalls which are crucial for the production of hydro-electricity.
6. Rivers act as natural boundaries between countries.
7. Provides fertile land i.e. around riverbanks which possess fertile soil deposit and debris. Rivers may also be used for irrigation (Artificial watering of crops) e.g. Plain of Lombardy, Italy. Very important for agriculture. River Po and its tributaries used to water crops.

Dangers

1. **Flooding** – Damage to property, land, animals and homes. Valuable crops destroyed, Loss of Life, Famine or food shortage.
2. **Accidents** originating from rapids and cataracts.
3. **Carry pollutants**: from factories and farmland which can harm livestock fish and other animals.
4. **Carry diseases.** Helps to spread deadly diseases in Third World countries for example bilharzia, typhoid and cholera among others.

Answers

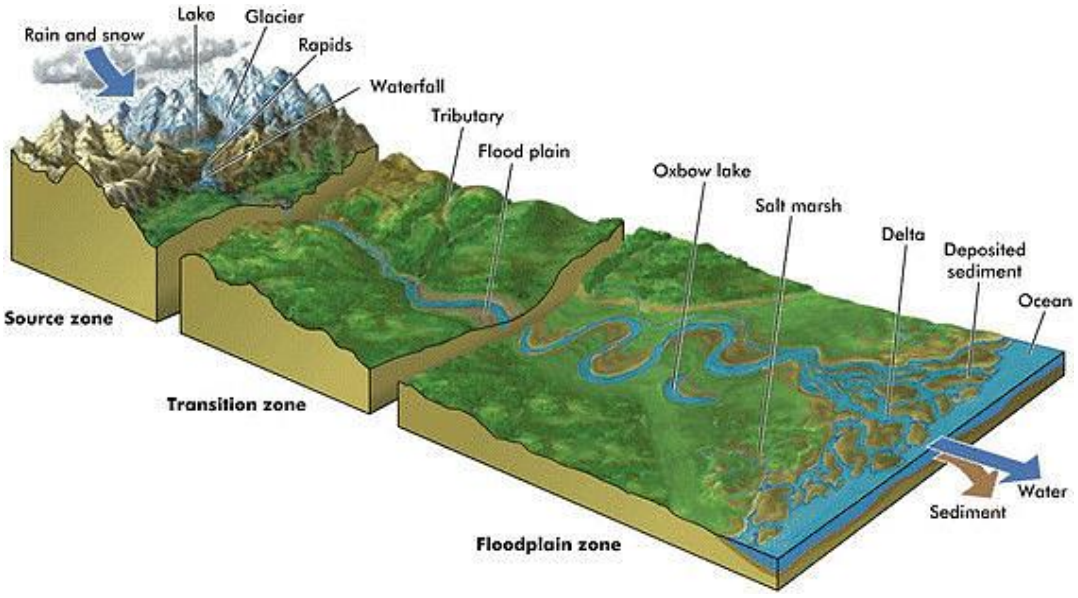
Comprehensive Activity 5 Pg. 36



1. Naming parts of the diagram above

1. Source.
2. Tributary.
3. Confluence.
4. Waterfall.
5. Meander.
6. Levee.
7. flood plain.
8. Oxbow lake.
9. Salt marsh/estuary/delta
10. Mouth.

2. *Creating a 3d model of a river system.* (the teacher is supposed to orgarnize students in random groups and provide them with the items indicated on the student's on page 35. Assess the final products of the models and award marks.)



Exercise 4 Pg. 36

1. *Definition of terms:*
   a) *The source or headwaters* of a river or stream is the furthest place in that river or stream from its estuary or confluence with another river, as measured along the course of the river.
   b) *Tributary or affluent* is a stream or river that flows into a larger stream or main stem (or parent) river or a lake.
   c) *A confluence,* where two or more bodies of water meet together, usually refers to the joining of tributaries.
   d) *A meander* is one of a series of regular sinuous curves, bends, loops, turns, or windings in the channel of a river, stream, or other watercourse.
   e) *An estuary* that part of the mouth or lower course of a river in which the river's current meets the sea's tide.

f) *A river delta* is a landform that forms from deposition of sediment carried by a river as the flow leaves its mouth and enters slower-moving or standing water.

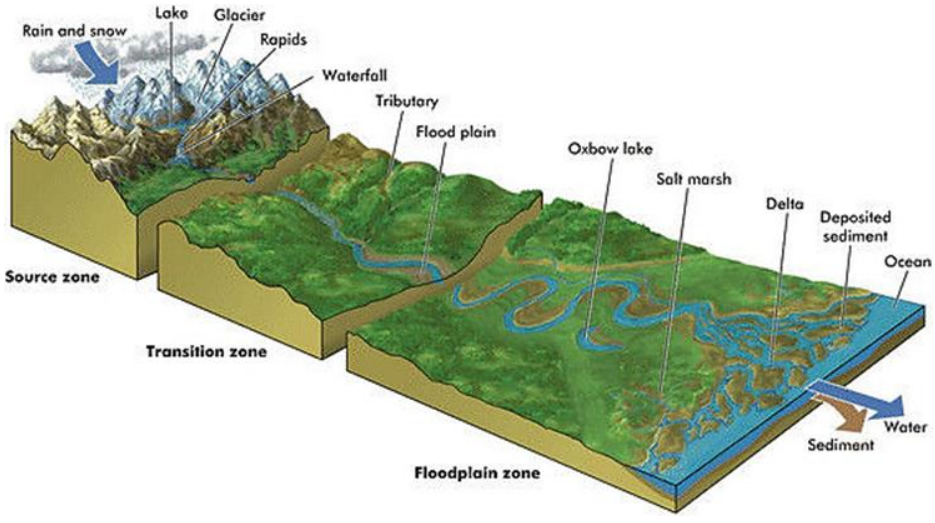
g) *A mouth:* The place where a **river** enters a lake, larger **river**, or the ocean is called.

2. *Formation of rivers:*

a) Through precipitation

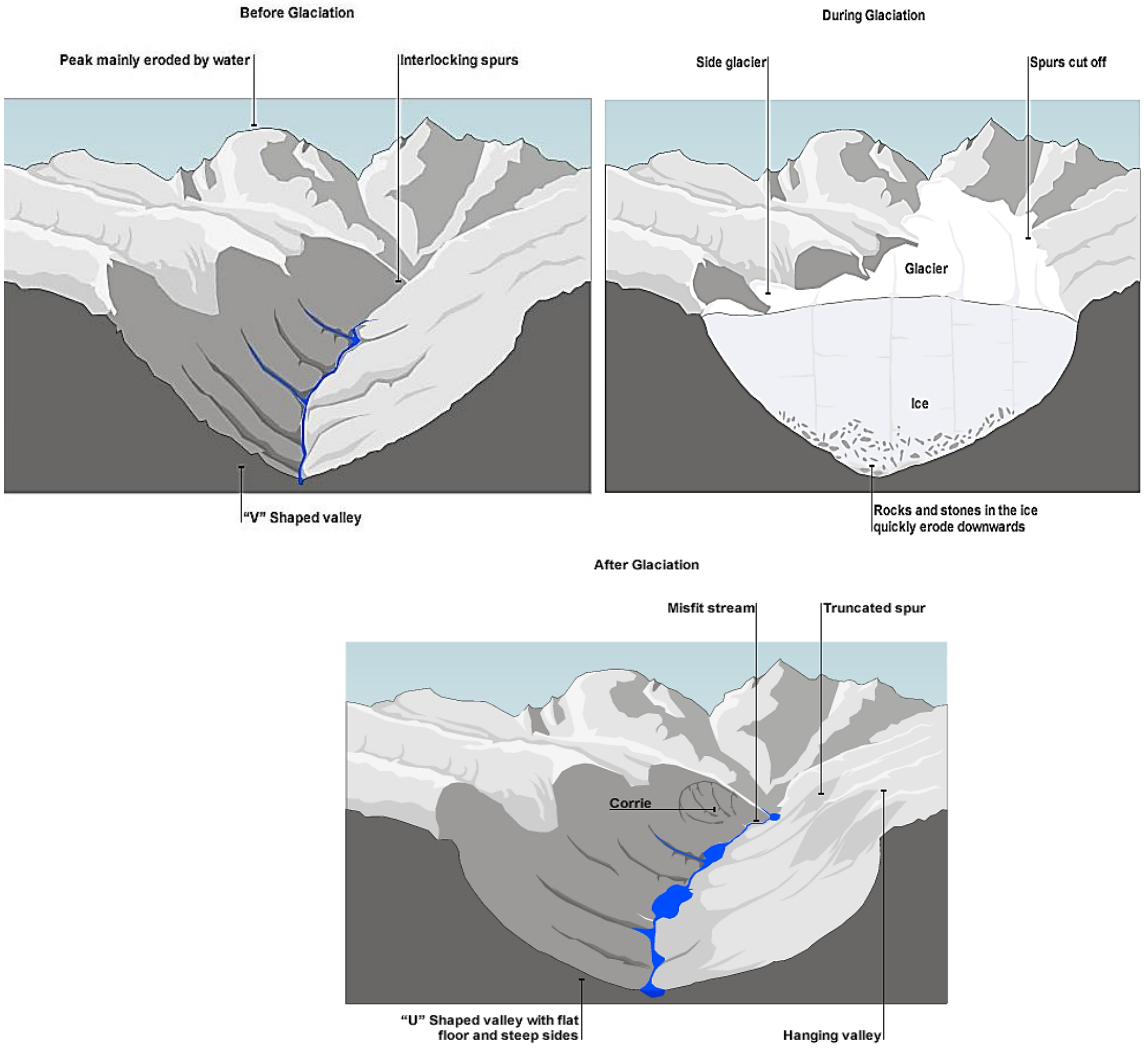
When a heavy rain falls on ground that is steeply sloped or is already saturated with water, water run-off trickles down Earth's surface, rather than being absorbed. Initially, the water runs in an evenly distributed, paper-thin sheet, called surface run-off. After it travels a short distance, the water begins to run in parallel rills and, at the same time, gathers turbulence. As these rills pass over fine soil or silt, they begin to dig shallow channels, called runnels. This is the first stage of erosion.

These parallel rills do not last very long, perhaps only a few yards. Fairly soon, the rills unite with one another, until enough of them merge to form a stream. After a number of rills converge, the resulting stream is a significant, continuously flowing body of water, called a brook. The brook now flows through what is termed a valley. As a brook gains sufficient volume from groundwater supplies, the volume of water it carries becomes more constant. Once the volume of water carried reaches a certain level, the brook becomes a river.



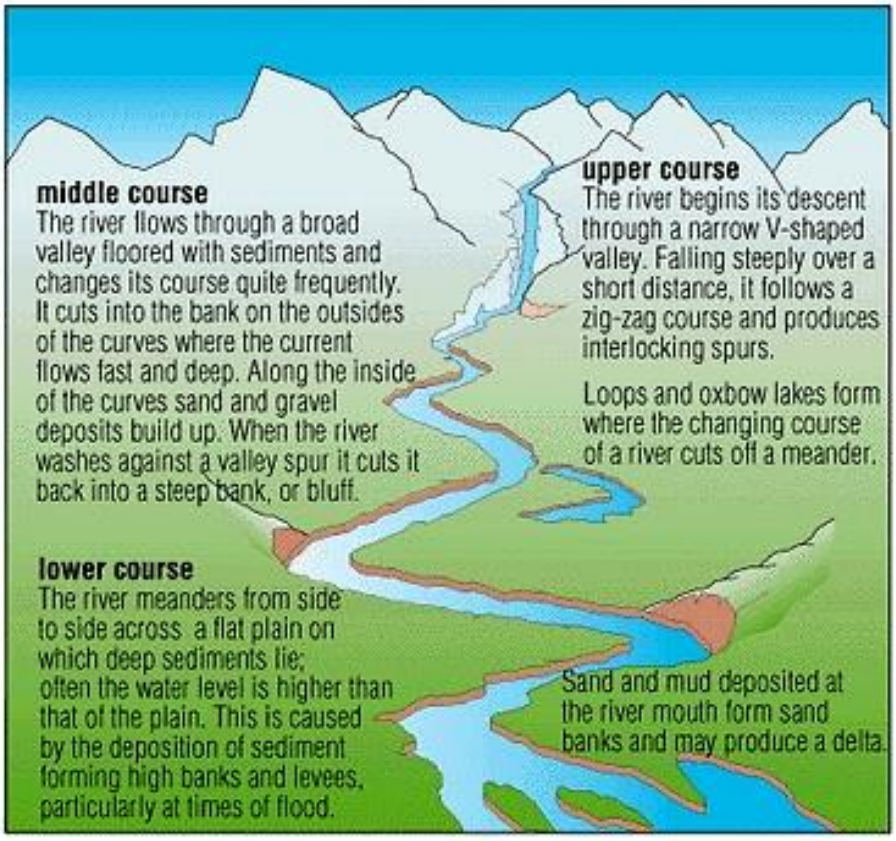
b) *Through glaciation:*

As glaciers melt the water starts flowing through the least resistant part. Initially these water are in the form of small streams. These forms rills then gullies. As time passes their path gets deepened due to downward cutting. At the mountain Slopes, rivers have huge energy. So they carry huge load and participate in erosion. During this stage river is engaged in downward cutting through attrition, abrasion, collision etc. We generally find these types of features: V shaped valley, gorges and canyons, rapids, cataracts, waterfalls and plunge pools, river capture due to head ward erosion etc.



3. *Formation of underground rivers.*
   Refer to the detailed notes provided on the student's book from page 32-33.

4. *Processes of river formation.*



Exercise 5 Pg. 41

1. *Major rivers of South Sudan:* river Nile, Sue/ Jur river, Bahr el Ghazal, Bahr al Arab and Sobat River
2. Lake Victoria
3. *Other rivers in South Sudan:* Adar River, Yabus and Daga River.
4. *Permanent rivers and seasonal rivers:*
   a) *Permanent rivers:* Jur/Sur river, Bahr-el-Ghazal, Bahr-el-Arab and Sobat river.
   b) *Seasonal:* Luri, Ibba, Ayii, river Singata, River Kimoru.

Lakes and Basins

The teacher is supposed to do the following in this sub topic.

1. Define what a lake is.
2. Explain the criteria used in classifying lakes.
3. Explain the processes leading to the formation of lakes.
4. Help learners locate the lakes of South Sudan using atlases and maps.
5. Guide the learners to perform the activities within the learners' course book.

Case study 4 Pg. 47

Impact of lakes on human activities

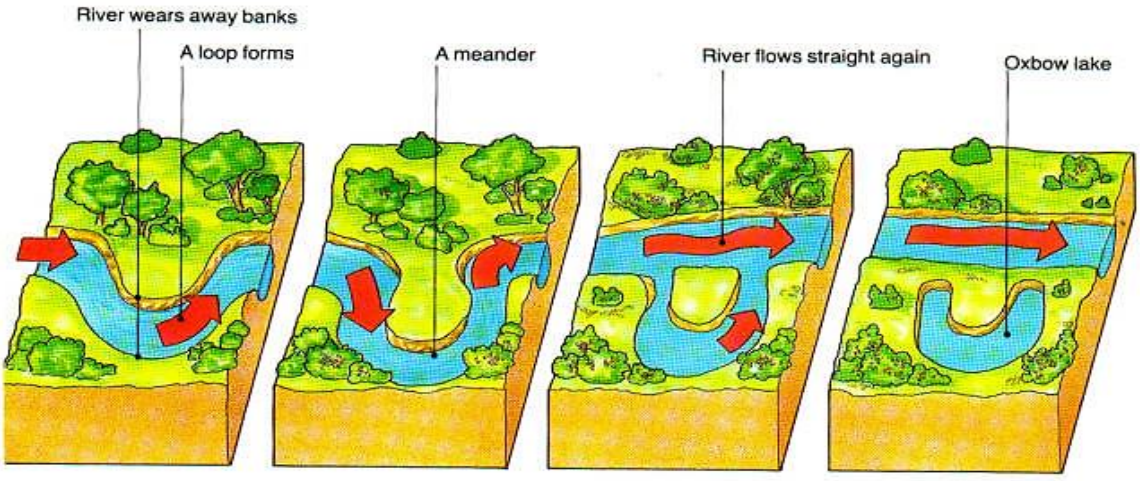
This is an open forum (there's no evaluation or assessment) Let the learners discuss in pairs. You can as well chose to engage the class in a full class discussion.

Answers

Exercise 6 Pg. 47

1. Definition of terms:
   a) *Lake:* is an area filled with water, localized in a basin that is surrounded by land, apart from any river or other outlet that serves to feed or drain the lake.
   b) *Pond:* A pond is a body of standing water, either natural or artificial, that is usually smaller than a lake.
   c) *Sea:* A sea is a large body of salt water that is surrounded in whole or in part by land

2. Formation of an oxbow lake:



△A river flowing over very flat land moves slowly in lazy curves or loops called meanders. As a river wears away the outside of each loop and builds up the inside, the meander becomes more U-shaped.

Eventually the river wears through the land within the meander and becomes straight again. The meander is cut off from the river and forms a horseshoe-shaped lake. This is called an oxbow.

3. Other processes leading to formation of lakes:
   a) Glaciation:
   b) Volcanic activity (caldera lakes)
   c) Landslide lakes.
   d) Artificial lakes: people damming and digging up basins in front of rivers and streams.

4. Classification of lakes.

All lakes are either open or closed. If water leaves a lake by a river or other outlet, it is said to be open. All freshwater lakes are open. If water only leaves a lake by evaporation, the lake is closed. Closed lakes usually become saline, or salty. This is because as the water evaporates, it leaves behind solids—mostly salts.

Plains and plateaus

The teacher is supposed to do the following in this sub topic.

1. Define what a plateaus and Plains are.
2. Explain the processes leading to the formation of plains and plateaus.
3. Help learners locate the plains and plateaus of South Sudan using atlases and maps.
4. Guide the learners to perform the activities within the learners' course book.

Case study 5 Pg. 51

Importance of plateaus and plains on humans

a) Plateaus are very important to man because they are rich in mineral deposits as a result of these mineral deposits, many of the mining areas in the world are located where there are plateaus.
b) Plateaus are very good sources of minerals such as Iron, copper, gold, diamonds, Manganese, coal, etc.
c) Areas that have plateau also have waterfalls as river falls from a great height of the plateau
d) Although plateaus are not very good for agricultural activities due to hard rock formation, hence, agricultural activities can be carried out at the base of the plateau where lava soils have deposited.
e) Plateaus that are formed from the lava of volcanoes have very fertile soil, making them useful for agriculture activities
f) Many plateaus have scenic spots and are of great attraction to tourists.
g) Plateaus serve as extensive grasslands for nomadic farmers who move from one location to another, to enable their animals feed on the green grasses.

Answers

Exercise 7 Pg. 51

1. Formation of plateaus and plains: **Plains** are flat surfaces at low levels. Coastal plains are made up of bits of rock that are carried along from rivers to the ocean or are worn away from rocks along the seashore. Sometimes inland plains are formed when seas or lakes get filled in with sediment or soil and become flat plains. **Plateaus** are raised areas of land with a flatter top. It differs from a mountain in that a mountain has a jagged peak at the top. Plateaus form both when mountains get worn down and their tops are not as jagged or when a large portion of flat earth is pushed up from the earth.

2. Definition of terms:
   a) *Plains and plateaus:* **Plains** are flat surfaces at low levels and **Plateaus** are raised areas of land with a flatter top
   a) *Butte and mesa:* A butte is like a plateau but its top is a bit more rounded. A **mesa** is a plateau with quite a flat top.
   b) *Inselberg:* an isolated rock hill, knob, ridge, or small mountain that rises abruptly from a gently sloping or virtually level surrounding plain.

3. Location of plains and plateaus in South Sudan:
   a) *The Ironstone plateau:* the ironstone plateau lies next to the border between Central African Republic. Democratic Republic of Congo and South Sudan.
   a. *The Lomareng plateau.* Lomareng Plateau is a plateau within South Sudan and is Southwest of Moru Kurun, Eyata Moru and Apaiyaputh.
   b. *The Boma plateau.* The Boma Plateau is a region in the east of South Sudan, located in the Jonglei and Eastern Equatoria provinces.

Content Map 2

Unit 2: Natural Ecosystems

Number of topics

3 topics

Approximated number of lessons

4-5 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners should use a range of resources (books, atlases, the internet and maps) to identify the natural ecosystems of the world in general and South Sudan in particular (e.g. tundra, alpine, temperate forest, rain forest, savanna grassland, woodland and sudd swampland.) they should make field visits and cases studies of local ecosystems. They should work collaboratively in understanding the importance of these natural ecosystems and their distributions, characteristics and interdependence within them. They should list these characteristics and inter-dependence within them. They should list these characteristics and interdependence and make presentations before the class. They should also carry out experiments to investigate the interdependence of climate, soil, water, plants, animals and humans. They should investigate issues related to sustainable use and management if the ecosystems.

Knowledge and understanding

- Identify the natural ecosystems of the world and South Sudan.
- Understand their distributions and characteristics.
- Explain the interdependence of climate, soil, water, plants, animals and humans on the ecosystems.
- Explain issues related to sustainable use and management of the ecosystems.

Key Inquiry questions

a) What do you understand by natural ecosystems?
b) Where do we find these natural ecosystems?
c) What are the importance and characteristics of each of these ecosystems?
d) How do the climate, soil, plants, water, animals and humans relate to the ecosystems?
e) What are the issues related to a sustainable use and management of the ecosystems?

Skills to be acquired

- Observe the various types and characteristics of natural ecosystems.
- Be able to explore the distribution of the various ecosystems.
- Investigate the influence of climate, soil, water, plants, animal and humans on the ecosystems.
- Discuss issues related to sustainable use and management of these ecosystems.

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in classifying ecosystems and presenting their research findings.

Attitudes

- Value and care for the natural ecosystems.
- Appreciate and value the importance of these natural ecosystems.
- Show concern for issues related to sustainable use and management of the ecosystems.

Link to other subjects

- *Environment and sustainability:* interdependence
- *Biology:* through study of life (organisms)

What is expected of the teacher?

The teacher is supposed to:

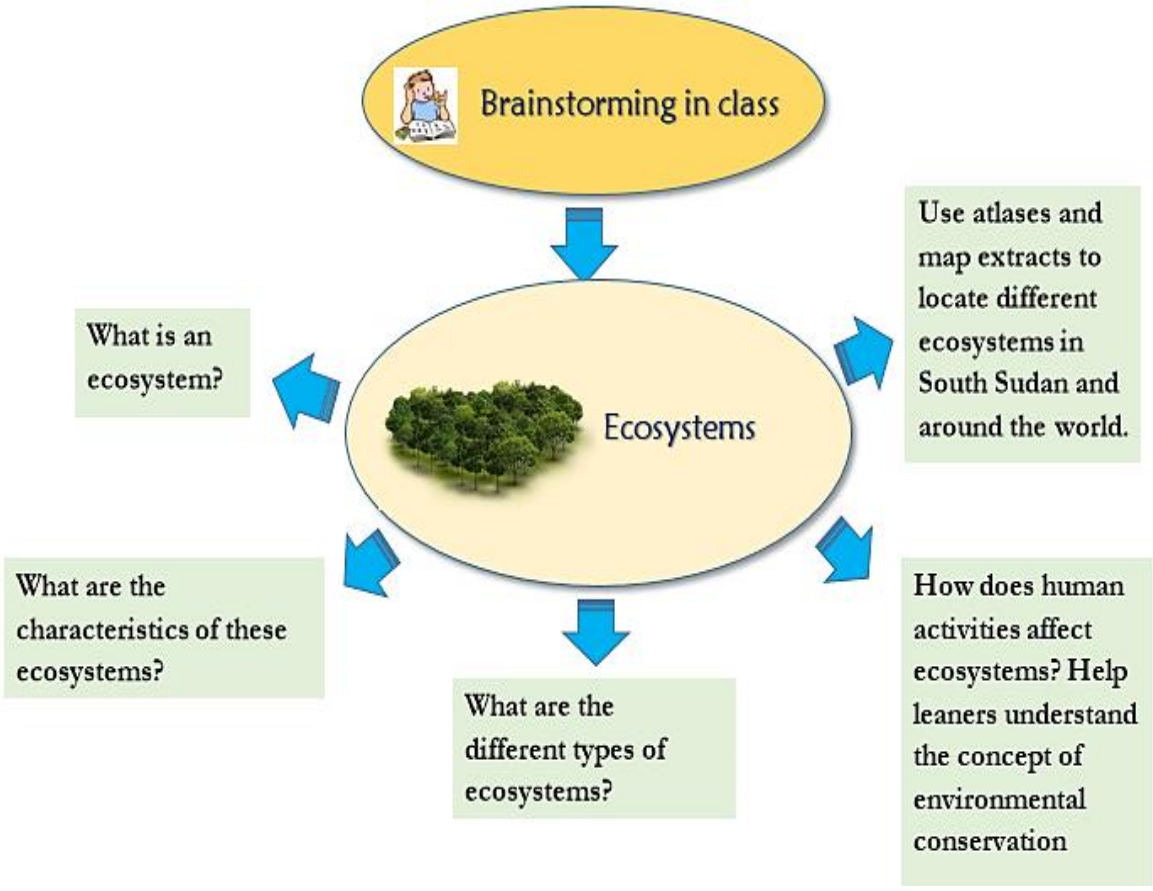
1. Define an ecosystem.
2. Explain the two types of ecosystems using appropriate examples (natural and man-made ecosystems). He/ she is supposed to, in –detail, explain the differences between the two ecosystems to the learners.
3. In detail, explain the characteristics of the various types of ecosystems including:
    a) Forest ecosystem (tropical, temperate rainforest and savanna woodlands).
    b) Tundra and alpine ecosystems.
4. Guide the learners in using maps, atlases and other resources to identify the ecosystems in South Sudan and other parts of the world.
5. Explain and describe the inter-dependence between animal species, plants species and humans in an ecosystem and how their relations affect the three (food web and food chain). Seemingly the teacher is also expected to engage the class in a discussion on the impacts of human activities on the environment (ecosystem).

Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Creative activities in the book are paramount for the student to understand the different topics practically before the actual lesson. Ensure that the class has all the materials needed. Organize the learners in random groups.

Brainstorming

Before introducing the unit to the learners. Engage the learners in a discussion to evaluate their comprehension on ecosystems. This will make them eager to learn about the new topic introduced. It will also make them attentive throughout the lesson. Use the following information.



Resources required in this unit

For an effective learning experience, the following resources should be provided to the learners in order to cover the various subtopics, activities and exercises provided within the student's course book. Liaise with the school's authority for the provision of these items. If not possible, come up with alternative lesson plans based on the topic coverage.

Subtopic	Requirements
Through the entire unit	Map extracts or copies of atlases.
Defining natural and man-made ecosystems – Creative Activity 4: Pg. 53 of the student's course book	Clay or plastacine, pieces of twigs, small carton boxes, glue, pair of scissors, small wooden blocks and pieces of paper enough for the number of groups created.
Field trip (pg. 71)	Liaise with the school's authority to organize a field trip. Check the explanation on page 41 on this book.

Creative activity 4 Pg. 53

Making models of Natural and Man-made ecosystems

Organize the learners into groups. Further divide the groups formed into two:

a) One cluster to make models on natural ecosystems.
b) The other to make models on natural (man-made ecosystems).

Ensure that all the groups has all the materials needed. Guide the learners to follow the steps given in the student's course book. Appoint a leader in each group to be responsible for the collection and returning of the materials after the activity/ experiment. The leader should ensure that his/ her group members clean their area of work.

Follow the instructions below:

Natural ecosystem	Man- made ecosystem
Requirements: clay/ plastacine, pieces of twigs, pieces of grass. *Steps* 1. Make sure your group has the materials required. 2. Be creative, using the materials come up with designs of a forest with all the natural features within it: rivers, trees, grass fields, wild animals etc.	*Requirements:* clay/ plastacine, pieces of twigs, pieces of grass, wooden blocks, carton boxes, glue and pieces of paper. *Steps* 1. Make sure your group has the materials above. 2. Be creative, using the materials provided come up with models of human settlements including cities. *(Include roads, vehicles, etc.)*

Note: This activity will make the learners understand the characteristics of man-made ecosystems and natural ecosystems and be able to differentiate between them.

Case study 6 Pg. 70

Environmental consevation and effects of human activities to the ecosystems (group presentation)

1. Various ways we can conserve our environment
    a) Conserve water
    b) Proper disposal of waste
    c) Avoid deforestation.
    d) Minimize the use of oil to avoid air pollution and oil spillage from tankers.
    e) The government making laws on environment including poaching and cutting down of trees.
    f) Plant trees after cutting.
    g) Recycle plastic materials.
    h) Reduce on the use of plastic.
2. How human activities affect the ecosystem
    a) Environmental pollution:
        i. Oil spillage from oil drills near seas causes animal and plant species in the sea and oceans to suffocate since oil blocks oxygen from reaching them.
        ii. Use of fossil fuels by industries and vehicles releases carbon dioxide in the atmosphere which contributes to global warming.
        iii. Chemical waste from industries are washed down to rivers poisoning animals and plants.
        iv. Deforestation destroys plant species and also making animals homeless. It can also contribute to soil erosion, dersertification and greater incidence of landslip on slopes.
        v. Poaching makes animals extinct.
    b) Effects of pollution on plants and animals.
        i. Chemical waste from industries kill and posion animals. It also destroys plants species.
        ii. Air pollution leads to global warming, accelerating desertification and reduced rainfall. Causing plants to wither and die.

iii. Oil spillage and hot water waste from industries into water bodies such as rivers leakes and oceans deprive animals and plant species of oxygen leading to their deaths.

Field trip 1(Pg. 71)

Visiting a nearby National Park

What the teacher should do:

- Use of outdoors or visit a nearby National Park or Game Reserve to understand what a natural ecosystem entails. The teacher should communicate with learners to educate their parents on the importance of the trip in their studies so that they can pay for their learners.
- He or she should communicate and make arrangements with the school administration to make reservations for the trip.
- Formulate questions for the learners before the trip, this will make them know that the trip is an academic trip not just a vocational trip. **Refer to Page 68 of the learners' course book.**

Field Trip 1

Visiting a nearby National Park

Take a visit at any nearby National Park or game reserve and observe the relation of the animals within the National Park or game reserve to the environment.

After the visit, answer the following questions:

a) What ecosystem is found in the National Park or Game Reserve?
b) What indigenous plant species and endangered animal species are found in the National Park or Game Reserve?
c) How do the animals in the Game Park or the Game Reserve relate in the ecosystem within the Game Park or the Game Reserve? (Draw a food web to justify your answer).

- During the trip, make the learners pay attention to the tour guide. Let them answer the question provided **after** the visit.

Answers

Exercise 8 Pg. 71

1. Definition of terms:
    a) *Ecosystem.* An ecosystem includes all of the living things (plants, animals and organisms) in a given area, interacting with each other, and also with their non-living environments (weather, earth, sun, soil, climate and atmosphere).
    b) *Food web.* A natural interconnection of food chains and a graphical representation (usually an image) of what-eats-what in an ecological community.
    c) *Forest.* A piece of land with many trees
    d) *Tundra ecosystem.* A type of biome/ ecosystem where the tree growth is hindered by low temperatures and short growing seasons.
    e) *Alpine ecosystem:* a type of natural region or biome that does not contain trees because it is at high altitude. The high altitude causes an adverse climate, which is too cold and windy to support tree growth.
    f) *Savannah.* A savanna or *savannah* is a mixed woodland grassland ecosystem characterized by the trees being sufficiently widely spaced so that the canopy does not close.
2. The difference between man-made ecosystem (unnatural ecosystem) and natural ecosystem.

Natural ecosystem	Man-made (unnatural ecosystem)
• Consists of many species of plants and animals • Genetic diversity is very high • The sunlight is the energy source for autotrophs (plants) and its energy drives all biological cycles. • Food chains are long and complex.	• Consists of a major crop plant (monoculture) other species around are called weeds and farmers use chemicals to destroy weeds. • Genetic diversity is very low and other plant species are removed using weedicides. • The sunlight is the ultimate energy source for plants but artificial fertilizers, manures and other nutrients are externally supplied to the soil.

• Productivity is extremely variable and depends on the environment. In tropical rainforests, productivity is very high, but in deserts, productivity is very low. • Naturally sustainable.	• Designed for high productivity to be used for human consumption. • Unsustainable as majority of fertilizers are from fossil fuels which are non-renewable and further adds to water pollution, bio magnification and other ecological disturbances.

3. Characteristics of natural ecosystems.
    a) They have a feeding hierarchy of consumers that is, from producers to quaternary consumers.
    b) They have biodiversity.
    c) Sunlight is the major source of energy for plant species.
    d) They have regular temperature and rainfall patterns.
    e) Productivity varies depending on the type of ecosystem. Tropical rainforest have high productivity while deserts have low productivity.
4. Types of forests ecosystems.
    a) Tropical rainforests.
    b) Temperate rainforests.
    c) Savanna woodlands.
    d) Forest plantations.
5. The differences between the arctic tundra and the alpine tundra.
    i. The arctic tundra is near the North Pole, alpine tundra is on the tops of mountains.
    ii. There are no plant or very limited vegetation cover on the arctic tundra because of its cold and desert like conditions while the alpine tundra has modified vegetation.
    iii. Temperature in the two ecosystem varies. The arctic tundra has extremely cold temperature than the alpine tundra.
6. Different types of savannah woodlands.
    a) Tropical and subtropical savannahs.
    b) Temperate savannahs.
    c) Mediterranean savannahs.
    d) Flooded savannahs
    e) Montane savannahs.

7. Location of the sudd swampland in South Sudan.
   The sudd swampland is located Al-Sudd, swampy lowland region of central South Sudan, 200 miles (320 km) wide by 250 miles (400 km) long. It is drained by headstreams of the White Nile in the Centre and the Al-Ghazāl River in the west.
8. What is ecosystem management?
   Ecosystem management is a process that aims to conserve major ecological services and restore natural resources while meeting the socioeconomic, political and cultural needs of current and future generations.

Content Map 3

Unit 3: The Economy of South Sudan

Number of topics

3 topics, 8 subtopics

Approximated number of lessons

4-5 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners should use a range of resources (books, atlases, and maps) plus other geographical charts to identify the economic activities in South Sudan. (E.g. mining, fishing, quarrying, industries, trade and agriculture) and compare these activities to other contrasting areas such as North America and the Rhineland. They should also conduct case studies, field visits and library research. They should plan and carry out investigation and classifications of the economy.

They should sort and analyze the factors affecting various economic activities of the country as well as identify the factors that sustain the economy.

Describing the Economy of South Sudan

What is expected of the teacher?

Knowledge and understanding

- Identify the economic activities of South Sudan.
- Compare these activities to other contrasting areas/ regions.
- Explain the factors affecting the various economic activities.
- Identify factors that sustain an economy. They are also to understand the South Sudanese economy in relation to other regions of the world.

Key Inquiry questions

a) How can we compare the economic activities of South Sudan?
b) What are the factors affecting the various economic activities of the country?
c) What measures can be applied to sustain the economy?

Skills to be acquired

- Observe the various economic activities of the country to make comparison to other regions of the world.
- Investigate the factors affecting economic activities of the country.
- Be able to locate the different types of economic activities.

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in planning and carrying out investigation and classification of the economy.

Attitudes

- Value and care for sustainability of the economy.
- Show concern for economic development in both schools

Link to other subjects

- *Environment and sustainability:* Economic sustainability.

curriculum and other major institutions. • Appreciate the economic activities as a backbone of nation building.	

In this unit, the teacher is supposed to do the following:

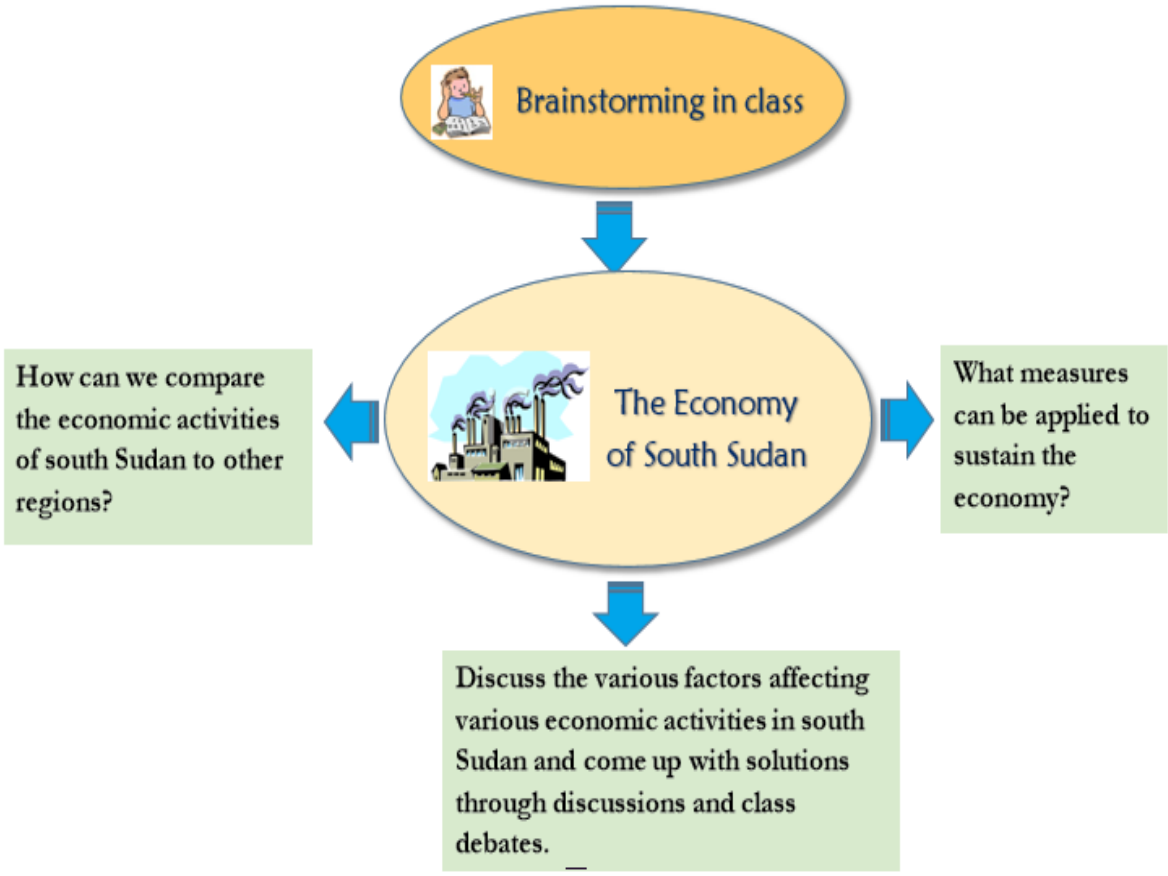
a) Read and gather information about the economy of South Sudan in order to familiarize with the topics to be tackled. Note making can be an important tool to improve on understanding before embarking into lessons.
b) Explain the currency of South Sudan as presented in the student's course book.
c) Explain the natural resources found in South Sudan.
d) Explain the economic activities practiced in South Sudan that is agriculture, trade, etc.
e) Explain the challenges facing the various economic activities.
f) Help the learners understand the South Sudanese economy in relation to other regions of the world and in this case, the East African region.

Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Progress checks and case studies in the book are paramount for the student to understand various investigative and research topics in relation to economic sustainability in South Sudan. Organize the learners in random groups.

Brainstorming

Before introducing the unit to the learners. Engage the learners in a discussion to evaluate their comprehension on the economy of South Sudan. This will make them eager to learn about the new topic introduced. It will also make them attentive throughout the lesson. Use the following information.



Resources required in this unit

For an effective learning experience, the following resources should be provided to the learners in order to cover the various subtopics, activities and exercises provided within the student's course book. Liaise with the school's authority for the provision of these items. If not possible, come up with alternative lesson plans based on the topic coverage.

Subtopic	Requirements
Through the entire unit	Map extracts or copies of atlases.
The currency of South Sudan	South Sudanese notes and coins.
Case Study 7 Page 86.	Supplementary books (preferably from the school's library, if any) with information about the economy of South Sudan.

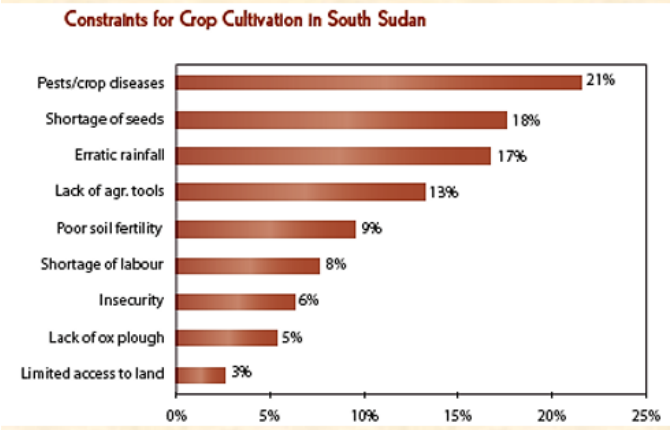
Note: For the case studies within the student's course book, the teacher should organize a library session for learners to use a wide range of books.

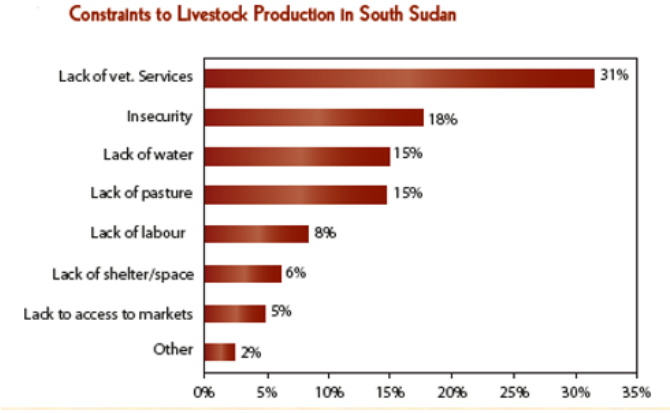
Answers

Case study 7 Pg. 86

Finding solutions to the problems facing agriculture in South Sudan (Group presentation)

For this case study, the students are supposed to work as a team to come up with solutions to challenges facing the agriculture sector in South Sudan. They are to visualize themselves as the minister in the ministry of agriculture and try to solve the problems presented to them (see the graphical information below).





After conducting their research with the help of other educational materials within the school, they are supposed to present their finding before the class.

The following could be effective solutions to the challenges facing agricultural sector in South Sudan.

Suggested solutions to the problems facing crop production in South Sudan	Suggested solutions to the problems facing poultry and livestock production in South Sudan
1. Pest/ crop diseases: provision of organic pesticides to local farmers as well as sensitization on the importance of crop rotation in preventing crop diseases. 2. Shortage of seeds: the government of South Sudan should buy subsidized seed from other nations to mitigate the problem of shortage of seeds. 3. Erratic rainfall: planting of trees to increase the amount of rainfall within the country. Crop irrigation can also be a source of water to the crops. 4. Use of advanced farming technologies: such as the use of tractors, organic fertilizers as well as quality seeds can help to increase crop yields.	1. Building local veterinary schools: these schools will provide locals with the knowledge and skills to combat animal pest and diseases thus eliminating the problem of lack of veterinary services. 2. Insecurity: livestock raids can be combated by appointing several law enforces to guard affected states. Apprehended livestock thieves should be given a long term sentence to serve as an example to those who want to emulate them. 3. Lack of water and pasture: planting of trees can be an effective way to combat this problem. Trees will increase the amount of rainfall in the country thus an increase in pasture for the livestock. 4. Access to markets: farmers should be educated on the importance of maintaining their livestock to produce high quality yields. Locals will be interested in healthy animals.

Case study 8 Pg. 88

Finding solutions to the problems facing agriculture in South Sudan (Group presentation)

1. Poor storage: fish is a perishable product and requires proper storage in order to stay long. Local methods of preservation such as smoking and slating only applies to fish harvested at small scale proportions. Fish harvested at large scale should be stored in huge ice freezers or refrigerated rooms to keep the product from going bad.

Figure 2. Left, fish stored in an ice freezer and left, a huge fish storage freezing box.

2. Poor harvest: The government of South Sudan should sensitize its citizens on the importance of using local fish ponds as a way of harvesting fish. Harvesting fish on rivers and lakes may sometimes be less effective since the fishermen may harvest young fish. Fish farms and fish ponds are effective in a way that all the fish harvested are health and fully grown.
3. Proper feeding: this only applies to fish farmers who use their fish farms or fish ponds to harvest fish. Farmers are supposed to buy approved fish meals to and manage the water flow within the fish farms to prevent cases of fish diseases and infections. This leads to quality yields.

Case study 9 Pg. 91

The transport industry of South Sudan (roads)-group work & presentation

What are some of the hindrance/ challenges that the transport system faces in South Sudan?

1. The cost of constructing new roads has increased both locally and internationally.
2. Inadequate equipment: There are inadequate equipment which are vital in quality road construction.
3. Inadequate human resources: The current National Road Safety Council and South Sudan Regulatory Authority do not have adequate competent human resources and other logistics.
4. Education: There is still less sensitization of the people about road sector.
5. Weak regulation: There is still weak regulatory framework for the road sector and thus a need for a sector policy.

Case study 10 Pg. 95

The Economy of South Sudan (Group presentation)

Note: This is one of the biggest activity among all case studies in the student's course book. This requires adequate time and preparation. The teacher can choose to give the

activity to the groups over the weekend or even for a whole week depending on his/her teaching schedule. Encourage full participation of each and every student in their various groups.

Group discussion and presentation 1

a) Measures that can be applied to sustain the economy of South Sudan.

i. *Fostering peace and political stability*: for any economy to succeed, peace and political stability is required. When the two are evident, the economy of South Sudan will improve because people will now focus on sustaining themselves through economic activities such as trade and agriculture. Tourists and investors will be interested hence opening opportunities for the people and government of South Sudan.

ii. *Encouraging different methods of agriculture.* Most of the farmers in South Sudan are small scale subsistence farmers who only plant food for their consumption. If the government comes up with new ways and means of encouraging these farmers to start engaging themselves in largescale food production, the government will have a chance to open up food processing industries hence more exports as a form of government revenue.

iii. *Public sensitization and education.* If the government of South Sudan comes up with forums and education programs for the unemployed people to get skills and knowledge such as tailoring, agriculture etc., business opportunities will rise leading to increased trading activities in the country.

iv. *Industrialization:* opening up industries (manufacturing, processing etc.) will lead to jobs, development of roads and towns. This will in turn pave way for an improved economy in South Sudan.

v. *Trade blocs:* if the country registers itself to some of Africa's successful trade blocks such as COMESA, EAC etc. the country will earn export and import privileges hence more profits in the country's export and reduced taxation on its imports.

b) Factors affecting the economy of South Sudan

- One of the major hindrances facing South Sudan in participating actively in regional and world trade has been high transport costs. South Sudan is a landlocked country with poor domestic infrastructure. Most of its road network is unpaved.

- Labor costs in South Sudan are among the highest in the region. Years of conflict have left the population with low levels of education and skills. In the short run, this may present another barrier for South Sudan in attracting foreign direct investment flows. Rather than investing in South Sudan, firms may locate in other community countries and export their products to South Sudan, benefiting from the favorable tariff structure.
- Conflict and clashes: South Sudan has experienced a prolonged civil war due to oil and political instability. This has presented the country with a barrier to economic growth thus low tourist and investor visits to the country. This has also lead to poor development to major towns in the country. However, peace is making a comeback to the nation giving hope to its citizens.

Group discussion

Comparing the economic activities of South Sudan to other regions

Guide the learners in comparing the following economic activities of South Sudan to other regions. Use library material, maps and atlases as reference materials.

i. Gold mining in South Sudan and South Africa.
ii. Agriculture in Kenya and in South Sudan.
iii. Oil mining in the Middle East and in South Sudan.
iv. Tourism in Kenya and in South Sudan.

Individual research

Hindrances to economic development of South Sudan

After the entire group activity, the teacher should organize the learners back to their normal siting positions to do the question as presented in their course book. They may

work in pairs (depending on their class arrangement). The teacher may choose to evaluate and asses the answers of the learners or discuss with the learners after the activity.

Here are some of the answers:

1. Conflict & Instability

From cattle rustling to tribal skirmishes to the full scale civil war that's currently swallowing the country, South Sudan hasn't seen a year of peace since independence. This instability is bad for business. It scares away foreign direct investment and reduces confidence among citizens, resulting in those with means keeping their money abroad where it is of no help to our economy.

2. Poor Infrastructure

If you've ever driven anywhere in South Sudan, you'll know the road network is bad. Not only do these bumpy dirt tracks restrict access from one region to another, but they cost businesses money to use In fact, 60% of South Sudanese businesses rate transport as a severe obstacle to trading. Bad roads means smaller loads and much longer travel times to get those goods to market. All this adds cost. Freight trucks drive an average of 6.4 km per hour so moving perishable goods, like foodstuff, is a big problem.

3. Dependence on Oil

As the old saying goes; never put all your eggs in one basket. But that's exactly what the government of South Sudan has been doing. According to the World Bank, South Sudan is the most oil-dependent country in the world, with oil accounting for almost the totality of exports, and for around 60% of our gross domestic product (GDP). Diversifying the economy took a back seat when the oil money was flying in. Now with production falling to below 160,000 bpd and the decline in oil prices from $110 per barrel to $55 per barrel, our economy is dangerously exposed.

4. Dependence on Imports

South Sudan has virtually no manufacturing or commercial agricultural base or services sector. So, the country has to import everything. The money we earn from oil is spent abroad on purchasing essentials, leaving precious little to stay in circulation inside the country.

5. Low Human Capital

South Sudan has one of the world's lowest adult literacy levels. Only one in three South Sudanese can read and write. 4 out of every 5 of the working population are engaged in non-wage work, mainly in small scale farming and cattle herding. As a nation, we're largely unskilled and uneducated. This makes our country extremely unattractive to do business in.

6. Informal Economy

4 out of every 5 citizens live in rural areas far from population centers. 4 out of 5 people are engaged in non-wage work. No wages, mean no taxes. No taxes, mean no government revenue to investment in infrastructure and the delivery of services that can create wage paying jobs. This is a vicious cycle.

Comprehensive Activity 7 Pg. 95

Guide the learners to use maps, library books and atlases to identify the key oilfields, mining sites and fishing sites of South Sudan.

Exercise 9 Pg. 95

a) Refer to the course book.
b) Major sources of revenue in South Sudan.
   i. Government borrowing.
   ii. Personal income tax
   iii. Excise tax
   iv. Sales tax
   v. Oil revenue
   vi. Tourism and exports
c) Major challenges facing the following economic activities in South Sudan:
   1. Mining:
      - Regulatory capacity is weak

- Little prospecting carried out so far in South Sudan, though potentiality is believed to be high.
- Infrastructure not yet in place for mining
- No industrial scale mining activity so far in South Sudan
- Large potential for a number of minerals (e.g. gold, iron, copper, etc.) unexplored.
- Lack of local human capacity to manage the sector.

2. Fishing.

- Poor storage, lack of availability of ice and poor transportation conditions (cool boxes, mobile freezers, roads, etc.) make fish losses important. Though there are no recorded statistics on this issue, overall losses of fresh fish between capture and landing are probably comparable with or higher than those of most countries in East Africa (up to 50%).
- Post-harvest losses are important, exceeding 60 percent in some areas and fish sold is very poor quality.
- Ill-advised policies that have promoted subsistence fish farming, the lack of good quality fingerlings, feed and skills hamper efforts to develop aquaculture. Most producers depend on imported tilapia fingerlings and feeds from Uganda.

Content Map 4

Unit 4: Population trends

Number of topics

2 topics, 4 subtopics

Approximated number of lessons

4-5 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners should plan and carry out investigations on key population trends and issues of South Sudan, using a range of books, atlases and extracts (map extracts and photographs). They should sort and analyze the settlement patterns practically through field visits and case studies. They should relate the issues they identify in South Sudan to similar contrasting areas of the world both in Africa and elsewhere.

Learners should cooperate to analyze and identify economic implications of the population trends on human settlement patterns in South Sudan and elsewhere in the world.

They should use a range of maps and charts that show population and population change.

Knowledge and understanding

- Describe the population trends and settlement patterns.
- Identify the economic implications of the population trends to humanity and settlement patterns.
- Compare and contrast the population trends and settlement patterns of South Sudan with Africa and other parts of the world.

Key Inquiry questions

a) What do you understand by population trends?
b) How do we describe the settlement patterns of South Sudan?

c) How does population trends in South Sudan relate to other parts of the world?

d) What are the economic implications of the population trends on human and settlement patterns?

Skills to be acquired

- Observe and analyze the population trends.
- Collect data on population trends.
- Investigate on economic implication of the population trends to humanity and settlement patterns.
- Sort and analyze the settlement patterns and come up with concrete conclusion.

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in classifying, identification and organization of the population.

Attitudes

- Appreciate the economic implication of the population trends to humanity and settlement patterns.

Link to other subjects

- *Environment and sustainability:* population and sustainability.

Describing the Population and Settlement Trends of South Sudan

What is expected of the teacher?

In this unit, the teacher is supposed to do the following:

a) Read and gather information about the population and settlement trends of South Sudan in order to familiarize with the topics to be tackled. Note making can be an important tool to improve on understanding before embarking into lessons.
b) Explain the population trends according to:
   i. Age.
   ii. Birth rates.
   iii. Death rates.

Note: The teacher should illustrate and help the learners identify the reason behind these figures.

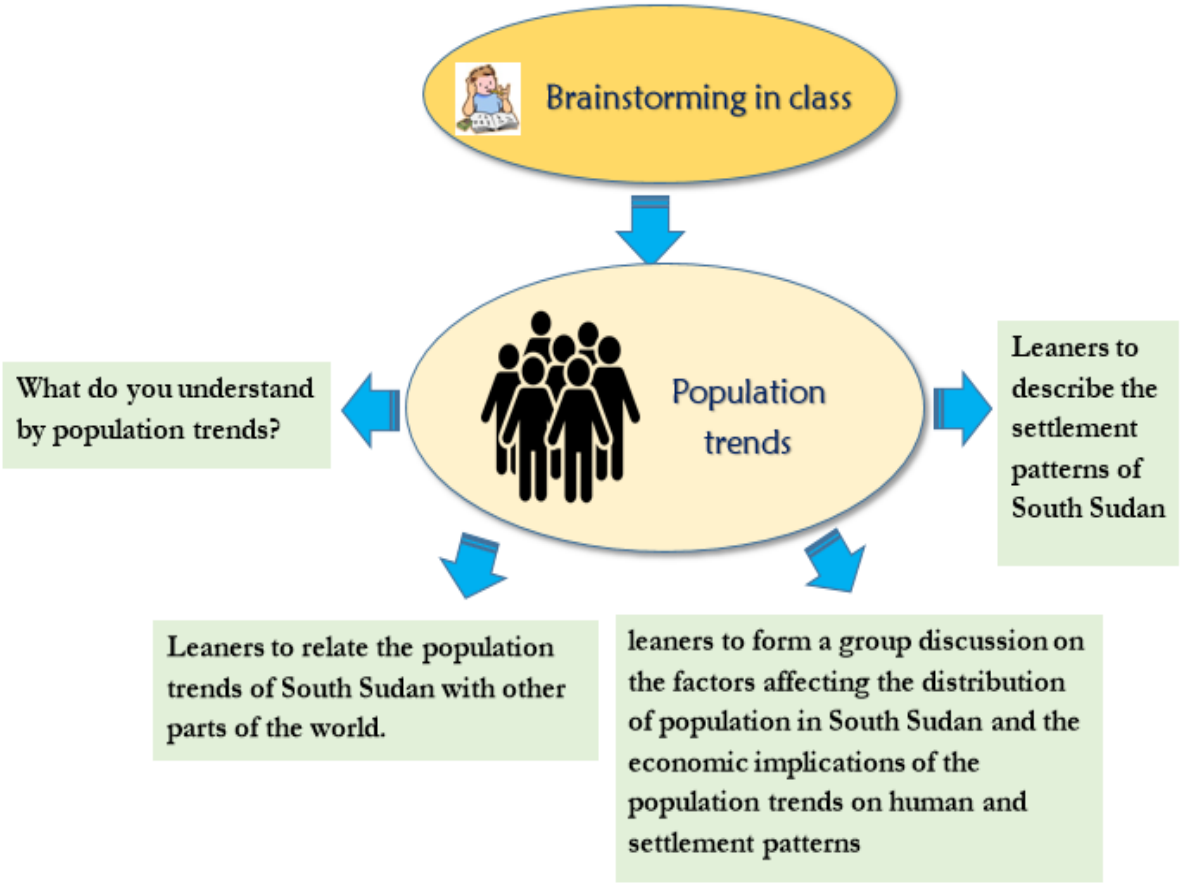
c) Explain factors that affect the population of South Sudan.
d) The teacher should also explain the settlement patterns in South Sudan and describe the causes of the same.
e) Engage the learners in case studies and research activities to investigate on the economic implications of the population trends to humanity and settlement patterns.

Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Progress checks and case studies in the book are paramount for the student to understand various investigative and research topics in relation to economic sustainability in South Sudan. Organize the learners in random groups.

Brainstorming

Before introducing the unit to the learners. Engage the learners in a discussion to evaluate their comprehension on population trends and settlement in South Sudan. This will make them eager to learn about the new topic introduced. It will also make them attentive throughout the lesson. Use the following information.



Resources required in this unit

For an effective learning experience, the following resources should be provided to the learners in order to cover the various subtopics, activities and exercises provided within the student's course book. Liaise with the school's authority for the provision of these items. If not possible, come up with alternative lesson plans based on the topic coverage.

Subtopic	Requirements
Through the entire unit	Map extracts or copies of atlases with maps showing population distribution in South Sudan.
Comprehensive activity 8, Case Study 10 and 11 of the student's course book.	Supplementary books (preferably from the school's library, if any) with information about the population of South Sudan.

Note: For the case studies within the student's course book, the teacher should organize a library session for learners to use a wide range of books.

Answers

Comprehensive Activity 8 Pg. 101

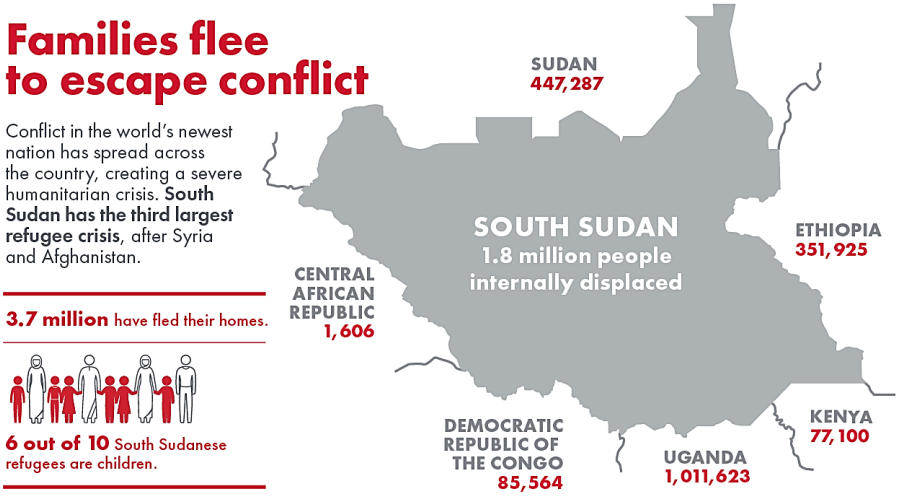
Refer to the notes provided on the learners' course book to evaluate the answers given by the learners on the question in the activity numbered above.

Case study 11 Pg. 102

The population trend of South Sudan according to migration and displacement (group discussion and presentation)

Reasons for the migration and displacement of people in South Sudan.

In South Sudan, there are two major reasons for migration. The first reason people leave Sudan primarily is in search for better economic opportunities. The second cause of migration from South Sudan is armed conflict and civil war. In 2011, it was estimated that over 2 million South Sudanese were living abroad. Over 50% of those people were living in neighboring African countries, with the other half residing largely in Europe and North America. In the past, Sudan was one of the most active countries in terms of accepting refugees and granting asylum. More recently, it has been a major country in producing refugees and displaced persons due the rise of conflicts in the region.



Exercise 10 Pg. 102

1. Definition of terms:
   a) Population distribution: Population Distribution is the way in which people are spread out across the earth Surface. Distribution is uneven and changes over period of time
   b) Population trend: the change in the size of population influenced by natality, mortality, immigration and emigration.
   c) Mortality rates and Birth rates: the number of live births in a population is referred to as the **birth / fertility rate.** The number of deaths within a given population is referred to as **Death rates.**

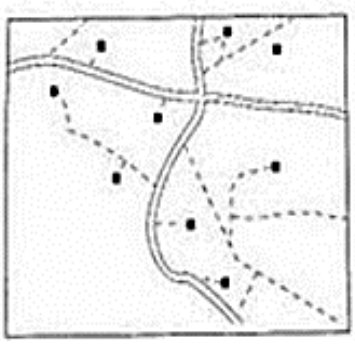
2. Factors that affect population distribution.
   - Relief (Topography): Where the slope is steep there is low or no population due to poor soil and nature of the land, but on gentle slope or flat surface there is high population since soil is good and mechanization can take place easily. Also low land tends to flood usually since people avoid settling in those areas.
   - Climate: Areas with reliable (moderate) rain have attracted high population but where there is poor rain like in the desert there is low population. Also areas with high or very low temperatures do not attract population while areas with moderate temperature attract population (high).
   - Vegetation: In areas where dense vegetation is difficult to clear like in Tropical forest of Amazon and Congo basin discourage people to live leading to sparse population or no population at all. Dense vegetation hinders penetration and development. In less dense vegetation people are attracted since they grow crops after clearing for cultivation.
   - Soil: Thin, infertile and badly leached soil discourages settlement since they can't support agriculture. Good soil attracts population.
   - Mineral and energy resources: Areas with mineral and energy resources attract population e.g. rand of S. Africa, iron and coalfield in Europe and Southern part of W. Africa where there are rich mineral deposits like diamond, oil, etc.
   - Natural Hazards: Areas with natural hazards like floods in low land, earthquakes, and tornadoes are avoided by people.
   - Diseases and Pests: People like settling in areas which are free of diseases and pests. There is high population in highlands of Tanzania which have healthy

climate like Arusha. But areas with high incidence of disease and pests infestation like mosquitoes that causes malaria, tsetse flies discourage population settlement.

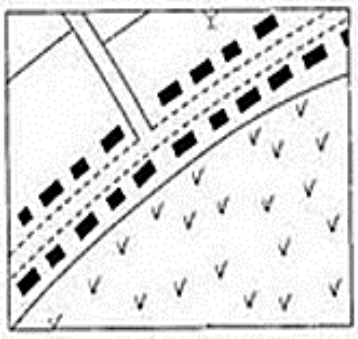
- Social – cultural aspects: Some tribes have a tradition of going to live in areas which have been left by their ancestors. Traditional beliefs like superstitions can make people avoid living in certain areas due to fear of risking their life.
- Political factors: Area with political stability and peace attract population but where there is political instability does not attract population. People avoid settled in area that has political conflict like in Sudan and Somalia.
- Transport and communication: Areas which are served with transport and communication attract high population since they can transport their goods to the markets areas. Also area where social services are ready available like in towns, unlike the rural areas where social services are poorly available.

3. What is the total population of South Sudan? 12,711,213 people.

Comprehensive Activity 9 Pg. 103



Dispersed settlement



Linear settlement

Nucleated settlement

Case study 12 Pg. 108

Causes of rural urban migration in South Sudan

The following are causes of rural urban migration in South Sudan:

- Searching of jobs in urban areas where opportunities of employment are high due to location of industries in these areas.
- Low prices for agricultural product. This makes the income for people living in rural areas low since agriculture is the major source of income in rural areas.
- Nature of education system. In many countries higher learning institution are located in towns making many youth to migrate to towns when they reach college going age.
- Insecurity in some rural areas. In many countries security organs are concentrated in towns making remote rural areas less secure.
- Social services gap between rural and urban areas. In many countries social services facilities such as referral hospital are located in urban areas making them more attractive to rural urban dwellers.

- Wage gap between rural and urban areas, many jobs in urban areas are paying higher wages than the same jobs in rural areas, making people to move to urban areas for search of higher wages.

Unit 5: Industrialization

Number of topics

3 topics, 5 subtopics

Approximated number of lessons

4-5 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners should use a range of books, atlases and extracts (map extract) to identify some of the industrialized regions/ zones of the world (e.g. the industrial revolution in Europe most especially in the UK, Rhineland and north America) and South Sudan to investigate their advantages and disadvantages.

They should work as a team to explore and investigate factors influencing industrial growth through field or case study, state problems facing their growth and suggest solutions for solving these problems.

Learners should understand key lessons from the industrialized regions that would help South Sudan industrialized growth.

Knowledge and understanding

- Define industrialization.
- Identify some of the industrialized regions of the world.
- Explain the advantages and disadvantages of industrialization.
- Explain the factors that influence the location of the industry.
- State the problems facing different types of industries and identify solutions.
- Learn key lessons from the industrialized regions that would help South Sudan grow.

Key Inquiry questions

a) What do you understand by industrialization?
b) What types of industries are found in South Sudan?
c) What are the advantages and disadvantages of industrialization?
d) What factors influence the location of industries?
e) What are the problems facing industrial growth in South Sudan?
f) How do we solve these problems?
g) What are the key lessons learned from industrialized regions that would help South Sudan grow?

Skills to be acquired

- Be able to classify industries into various types.
- Investigate the problems facing industrial growth and suggest solutions.
- Carry out analysis of industrial growth in South Sudan.
- Identify varieties of industries and find out the differences between them.
- Sort and analyze the cause and implications of industrial development.

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in analyzing, classifying and identifying industries.

Attitudes

- Show concern for effective industrial growth.
- Appreciate and value the importance of industries.
- Care for the causes and implications of industrial growth.

Link to other subjects

- *Environment and sustainability:* sustainable development.

Understanding Industrialization

What is expected of the teacher?

In this unit, the teacher is supposed to do the following:

a) Read and gather information about industrialization in parts of the world and in this case, Britain and South Sudan in order to familiarize with the topics to be tackled. Note making can be an important tool to improve on understanding before embarking into lessons.
b) Define industrialization to learners.
c) Explain the classification of industries.
d) Explain the factors leading to the location of industries.
e) Explain industrialization in Europe.
f) Help the learners locate the various types of industries in South Sudan using library materials, atlases and maps.
g) Help the learners understand the South Sudanese economy in relation to other regions of the world and in this case, the East African region.
h) Help learners identify the challenges facing the various types of industries in South Sudan.

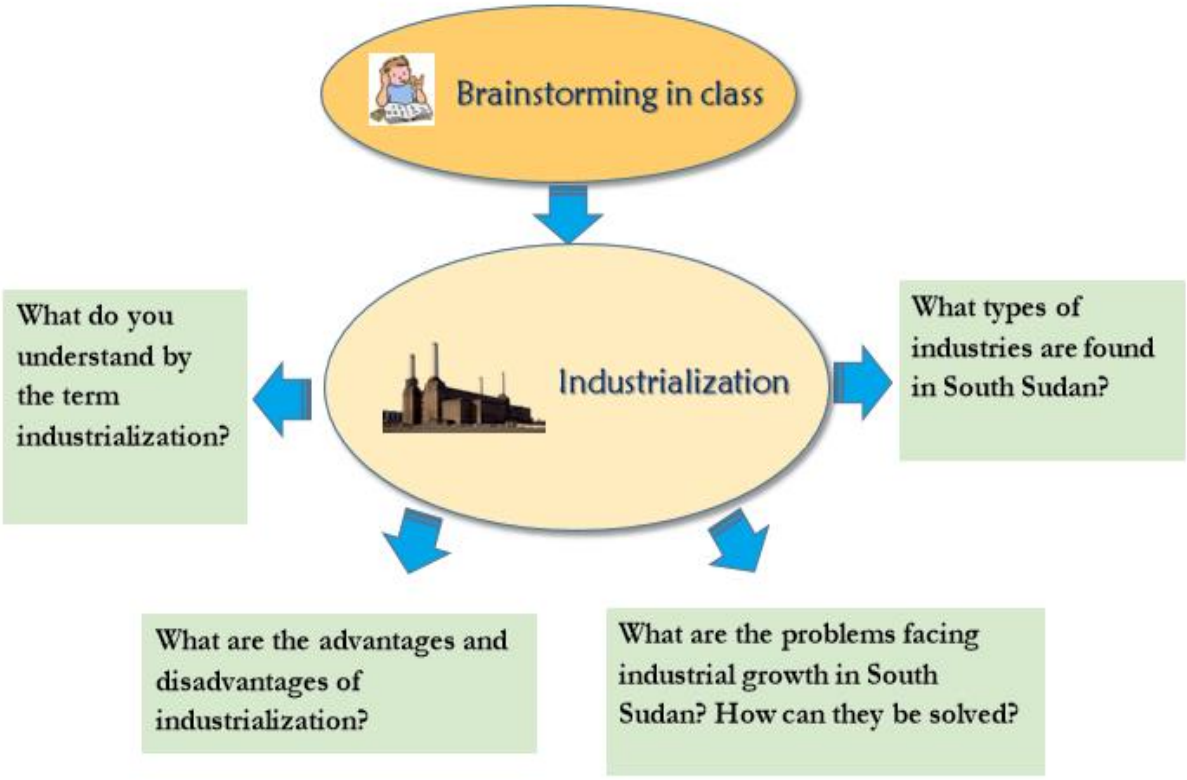
Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Progress checks and case studies in the book are paramount for the student to understand various investigative and research topics in relation to industrialization in South Sudan.

Organize the learners to tackle the case studies in random groups.

Brainstorming

Before introducing the unit to the learners. Engage the learners in a discussion to evaluate their comprehension on population trends and settlement in South Sudan. This will make them eager to learn about the new topic introduced. It will also make them attentive throughout the lesson. Use the following information.



Resources required in this unit

For an effective learning experience, the following resources should be provided to the learners in order to cover the various subtopics, activities and exercises provided within the student's course book. Liaise with the school's authority for the provision of these items. If not possible, come up with alternative lesson plans based on the topic coverage.

Subtopic	Requirements
Through the entire unit	Map extracts or copies of atlases with maps showing distribution of industries in South Sudan.

Answers

Case study 13 Pg. 114

Local industrialization- Group work & presentation

The government of South Sudan has decided to open up a manufacturing plant near your village.

a) What are some of the benefits to people near the industry?

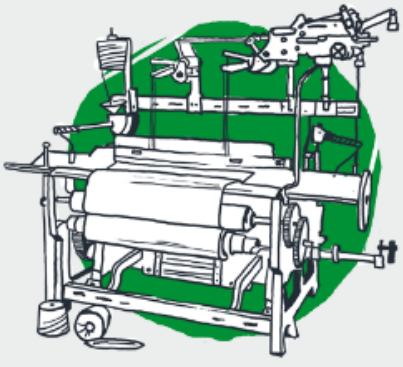
- Large scale production of goods from the industry which will be available to local consumers at much cheaper rates.
- There industry will present new job opportunities to the locals leading to the removal of poverty to a great extent.
- There will be a rise in the standard of living of the locals
- A number of substitutes in consumer goods will be available. The local customer will get wide variety of choices. If the government will choose to open other branches in various regions within the country.
- The industry will lead to development of new modes of transport making quick export and imports possible.

b) What will be some disadvantages of the industry?

- The immediate result is in the gradual disappearance of many natural resources, the pollution of land, water and air.
- The increase in vehicular traffic, launching of space ships and rockets by competing nations, the incessant working of machines in factories have brought in noise-pollution and dust and smoke.
- The general dirty and unhealthy conditions in and around the industrial sites have affected human health and happiness. Diseases, unheard of before, are spreading far and wide.
- There has been instances of child labor in factories.
- The exploitation of the poor by the rich has increases the crime-rate, isolation and sense of loneliness.
- The gradual displacement of manpower in industries is ultimately leading to unemployment.

Case study 14 Pg. 124

1. The four phases of industrial revolution:



First phase

End of 18th century

Introduction of mechanical production using hydro-electric and steam-powered equipment

1784
First mechanical loom

Fourth phase

Today

Today

Networking and exchange of information between human and machine

2. What can South Sudan do to grow industrially?

   The following strategies can be of importance in making the nation grow industrially:

- Privatization of old public sector industrial units: this involves encouraging foreign investors to run the old industries. By this, the local industries will be improved to world class conditions hence growth of industrialization in South Sudan.
- Promotion of industrialization in all regions of South Sudan: if all regions within South Sudan will have at least one industry, then the whole nation will be industrialized.
- Diversification of the economy beyond oil and services; the nation should focus on other industrial opportunities other than services and oil.
- Generation of sustainable employment opportunities.
- Establishment of a competitive manufacturing base.
- Progress towards a knowledge based economy.
- Development of education and skills.
- Improvement of infrastructure: building roads, power grids, schools, hospitals etc.
- Utilization of existing industrial units which include mining, leather, food processing, agro-industry and forest products, oil and petrochemicals among others.

3. Factors that affect industrial development:
   a) Quality of human resources: Manpower plays a significant role. In raising industrial productivity in most of the industries. If the labour force is not adequately qualified and/or is not properly motivated, all the steps taken to increase the industrial productivity will have no result the employees' performance and attitudes have an immense effect on the productivity of any industrial unit. Three important factors which influence the productivity of labour area (a) ability of the worker, (b) willingness of the worker, and (c) the environment under which he has to work.
   b) Availability of finance: The ambitious plans of an industrial unit to increase the productivity will remain mere dreams if adequate financial resources are not available to introduce technical improvements and give appropriate training to the workers. The greater the degree of mechanization to be introduced, the greater is the need for capital. Capital will also be required

for investment in research and development activities, advertisement campaign, better working conditions to the workers, up-keep of plant and machinery, etc.

c) Proper management of industrial resources: The significance of managerial talent has increased with the advancement in technology. Professional managers are required to make better use of the new technological development. Since the modern enterprises are run on a large scale, the managers must possess imagination, judgment and willingness to take imitative. The managers should be devoted towards their profession and they should understand their social responsibilities towards the owners of the business, workers, customers, suppliers. Government, and the society this is essential if the managers want to manage their organizations effectively. The managers should have conceptual, human relations and technical skills in order to increases the productivity of the enterprise.

Case study 15 Pg. 125

Industrialization in South Sudan - Group work & presentation

In groups investigate on the problems facing industrialization in South Sudan by comparing the development of industries with other regions such as united states, Britain etc. Come up with possible suggestion in solving the problems you have found to help South Sudan as a nation grow.

Problems facing industrialization in South Sudan.

One of the major hindrances facing South Sudan in participating actively in regional and world trade has been high transport costs. South Sudan is a landlocked country with poor domestic infrastructure. Most of its road network is unpaved.

Studies of informal, cross-border trade between Uganda and South Sudan show substantial mark-ups on goods once they enter Juba market. The largest portion of the increase in price is attributed to transport costs as well as other stamps and duties along the way. This is particularly challenging for a country like South Sudan that relies primarily on imports.

As part of the East African Community, South Sudan will be able to benefit from ongoing and future regional infrastructure projects. These include the port that is being constructed in Lamu, Kenya, and the E.A.S.S.Y cable, a 10,000km submarine fibre-optic cable along the coast of eastern and Southern Africa.

As infrastructure development is an expensive undertaking, regional collaboration will be vital for improving South Sudan's connectivity. Improved connectivity will, in turn, lower transport costs and thus the price of consumer goods in the country. At the same time, it will also improve access and competitiveness in regional markets for South Sudanese exports.

In terms of economic diversification, agriculture is one potential area South Sudan could capitalise on. According to some estimates, 70% of land in South Sudan is suitable for agriculture, but less than 4% is currently being cultivated.

If South Sudan can move towards mechanized agriculture, it not only has the opportunity to increase in-country production, but also to potentially export to the region. For example, the extensive flood plains of the Greater Bahr-el-Ghazal and Upper Nile areas may be suitable for rice production. To ensure its products are competitive, investments in infrastructure and connectivity will be essential.

In the short term, there will be some costs to accession. However, many of these costs can be mitigated with appropriate negotiations and domestic reforms. In particular, there is the potential that the cost of living may increase for consumers, as in some cases the current customs tariff bands in South Sudan are lower than the common external tariff it will have to adopt.

Rwanda is an example of a country that faced a similar challenge and managed to mitigate the effects by negotiating various flexible arrangements, including longer transition

periods for implementation. South Sudan has the opportunity to learn from and follow on Rwanda's lead.

Labor costs in South Sudan are among the highest in the region. Years of conflict have left the population with low levels of education and skills. In the short run, this may present another barrier for South Sudan in attracting foreign direct investment flows. Rather than investing in South Sudan, firms may locate in other community countries and export their products to South Sudan, benefiting from the favorable tariff structure.

Comparing South Sudan with other industrialized parts of the world.

South Sudan is a young nation, meaning it is still developing. Industrialized parts of the world such as America, Britain, Germany, china and Russia have been successful because of their well-developed infrastructure and use of advanced technology in agriculture. Most of these regions, practice large scale farming hence maximizing on the production of food products from food processing industries.

Advanced technologies power their industries. Most of their industries use nuclear and solar energy to run. Such countries place their interests above all before engaging in trade blocs and other trade alliances. They also venture into various types of investments such as fashion and clothing, education, communication technology, banking etc.

Comprehensive Activity 10 Pg. 125

- Make sure the entire class has copies of atlases, maps and other relevant reference materials.
- Help and guide the learners locate the different types of industries in South Sudan.

Exercise 10 Pg. 126

1. Definition of terms:
    a) Industrialization: the large-scale introduction of manufacturing, advanced technical enterprises, and other productive economic activity into an area, society, country, etc.

b) Industry: as an economic activity concerned with the processing of raw materials and manufacture of goods in factories. Industries are factories established for processing raw materials and manufacturing goods

2. Classification of industries
   a) Primary industries: Extract raw materials (which are natural products) from the land or sea e.g. oil, iron ore, timber, fish. Mining, quarrying, fishing, forestry, and farming are all example of primary industries.
   b) Secondary industries (manufacturing industries): Involve the manufacture of raw materials, into another product by manual labour or machines. Secondary industries often use assembly lines e.g. a car factory.
   c) Tertiary industries (also known as service industries): Neither produce a raw material nor make a product. Instead they provide services to other people and industries. Tertiary industries can include doctors, dentists, refuse collection and banks.
   d) Quaternary industries: Involve the use of high tech industries. People who work for these companies are often highly qualified within their field of work. Research and development companies are the most common types of businesses in this sector.

3. Factors that influence location of an industry.
   a) Geographical factors: presence of raw materials, type of climate, site requirements, presence of a source of energy and water and lastly presence of a reliable market.
   b) Non-geographical factors: availability of labour, government policies, availability of capital, efficient organization within the industry and availability of banking and insurance facilities.

4. South Sudan is a country rich with natural resources and investment opportunities. As a citizens of South Sudan, organize yourselves in groups and discuss some of the means to provide solutions to the problems facing the following industries:

Tourism Industry	Transport Industry	Mining Industry
• Liase with local and international media stations for the advertisement of tourist hotspots within the nation • Boost security around tourist hotspots and across the country • Build more accommodation and recreational facilities to accommodate more tourists. • Offer education and training to locals on ways of tourism. • Improve the condition of roads and other related infrastructure.	• Proper use of country revenue to facilitate the construction of local roads and highways. • In cases of finance shortages, the government should liaise with foreign investors and other institutions to fund the construction of local roads, railways and airstrips/airports. • Train locals to provide them with skills and knowledge on how to construct and manage the roads, railways and airports.	• Offer opportunities for foreign investors to research on the mineral productivity of the country. • Provide locals with training forums where they can be able to get the skills and knowledge required in mining. • With the help of foreign investors, build industrial scale mining plants around the country. • Improve infrastructure around mining areas to facilitate ease of transportation of minerals and related products.

Content Map 6

Unit 6: Climate Change

Number of topics

2 topics, 5 subtopics

Approximated number of lessons

4-5 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners should work in groups to research a range of sources about climate change (including technical papers, field visit and newspaper reports). They should explain the concept of climate change and analyze the causes and the actions being taken to prevent climate change. They should review the evidence that climate change is caused by human activities. Learners should write a balanced report that sets out the evidence and recommend a course of action.

They should initiate research projects to combat climate change and write a report on one of them.

They should research the effects of climate changes in various parts of the world, including the impact of climate changes in various parts of the world, including the impact of increases in temperature. Learners should use maps to show the impact of different temperature increases in various parts of the world

Knowledge and understanding

- Define climate and weather.
- State the elements of weather and describe how they are measured.
- Explain factors that influence climate change of a given area.
- Explain the meaning of climate change.
- Identify the course of climate change and suggest measures taken around the world to prevent it.

Key Inquiry questions

a) What do you understand by climate and weather?
b) What are the elements of weather and how are they measured?
c) What are the factors that influence the climate of a given area?
d) What do we understand by climate change?
e) What are the probable causes of climate change?
f) What is being done around the world to prevent climate change?

Skills to be acquired

- Analyze the evidence for climate change.
- Be able to analyze changes in climate, investigate their causes and implications,
- Observe and analyze how different elements of weather are measured.

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in analyzing the evidence of climate change.

Attitudes

- Appreciate the significance of climate change.
- Show concern for measure taken to prevent climate change.

Link to other subjects

- *Environment and sustainability:* climate change.

Differentiating Climate and Weather & understanding Climate Change

What is expected of the teacher?

In this unit, the teacher is supposed to do the following:

a) Read and gather information about industrialization in parts of the world and in this case, Britain and South Sudan in order to familiarize with the topics to be tackled. Note making can be an important tool to improve on understanding before embarking into lessons.

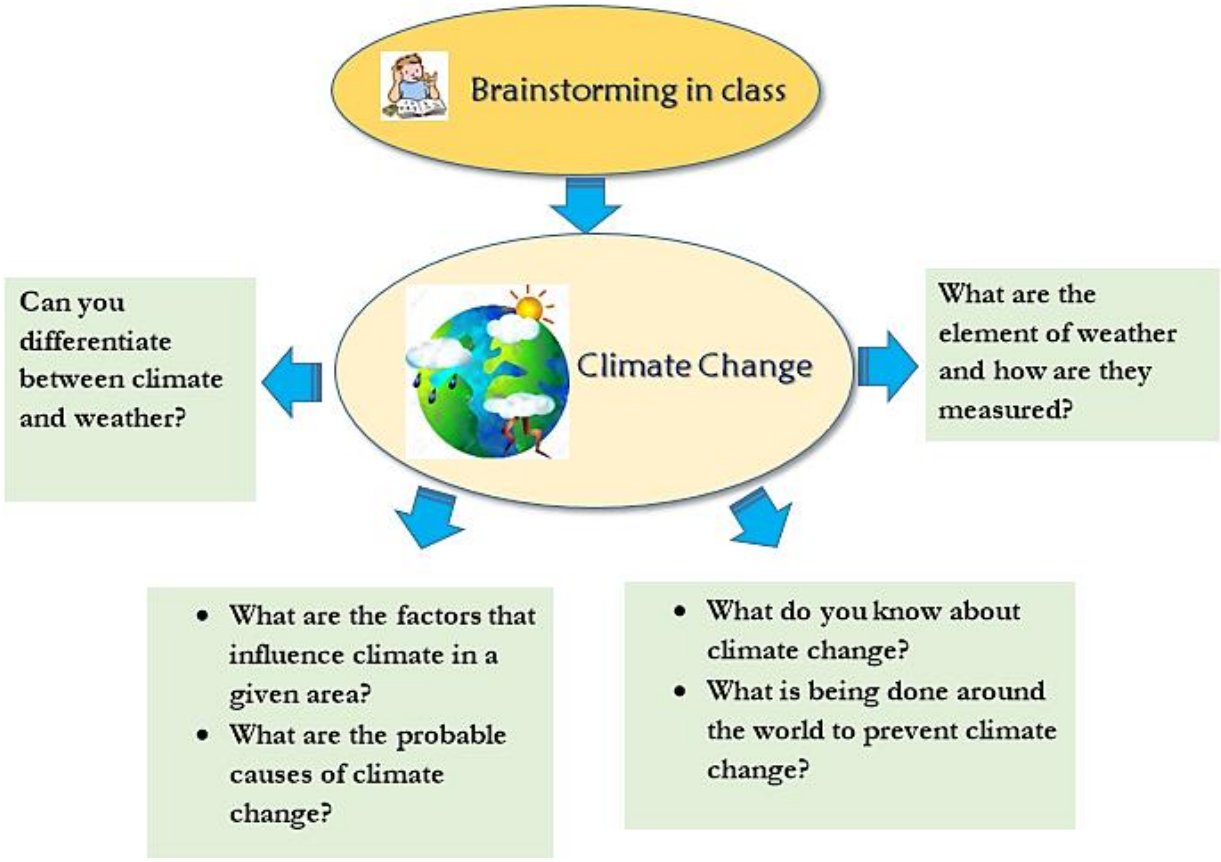
b) Define and differentiate climate & weather.
c) Explain the factors that influence the climate of a given area.
d) Explain the factors leading to the location of industries.
e) Explain the meaning of climate change.
f) Help the learners identify the causes of climate change and suggest measures taken around the world to prevent it.
g) Guide the learners to perform various case studies, creative and comprehensive activities within the course book.

Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Progress checks, case studies & creative activities in the book are paramount for the student to understand various creative activities, investigative and research topics in relation to weather, climate and climate change.

Brainstorming

Before introducing the unit to the learners. Engage the learners in a discussion to evaluate their comprehension on population trends and settlement in South Sudan. This will make them eager to learn about the new topic introduced. It will also make them attentive throughout the lesson. Use the following information.



Resources required in this unit

For an effective learning experience, the following resources should be provided to the learners in order to cover the various subtopics, activities and exercises provided within the student's course book. Liaise with the school's authority for the provision of these items. If not possible, come up with alternative lesson plans based on the topic coverage.

Subtopic	Requirements
Through the entire unit	Map extracts or copies of atlases.
Making models of weather instruments – Creative Activity 5: Pg. 136 of the student's course book	Manila file folders, Paper pins, scissors, glue, pencil and eraser, pieces of straw, modelling clay and paper plates enough for the number of groups created.
Field trip 2 (pg. 139)	Liaise with the school's authority to organize a field trip. Check the explanation on page 79 on this book.

Note: For the case studies within the student's course book, the teacher should organize a library session for learners to use a wide range of books.

Creative activity 5 Pg. 134-135

Making a wind vane

Ensure that all the groups has all the materials needed. Guide the learners to follow the steps given in the student's course book. Appoint a leader in each group to be

responsible for the collection and returning of the materials after the activity/ experiment. The leader should ensure that his/ her group members clean their area of work.

Explain how the model works in relation to the real wind vane.

Field trip 2 Pg. 137

Visiting a local weather station

What the teacher should do:

- Learners are supposed to visit a nearby local weather station to understand how weather instruments work. The teacher should communicate with learners to educate their parents on the importance of the trip in their studies so that they can pay for their learners.
- He or she should communicate and make arrangements with the school administration to make reservations for the trip.
- The learners are supposed to take with them notebooks and pens to take notes on how the following weather instruments work:

    1. Rainguage
    2. Aneroid barometer.
    3. Wind vane, wind sock and anemometer.
    4. The hygrometer
    5. The hydrometer.
    6. The barometer.

Answers

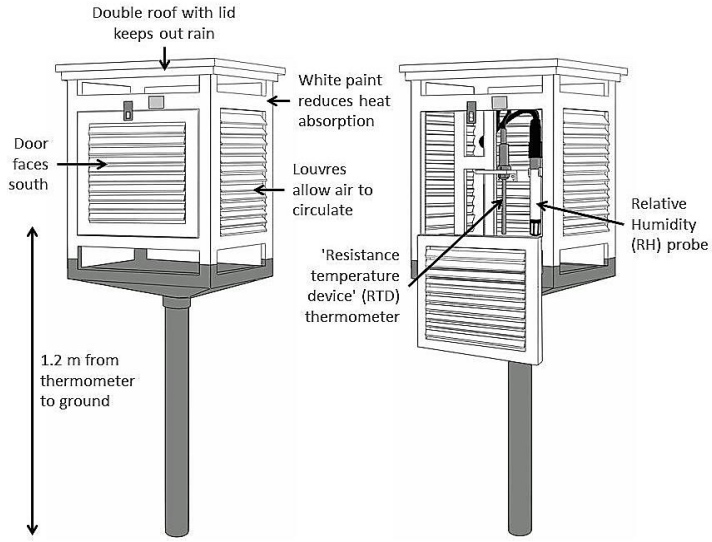
Exercise 11 Pg. 139

1. Explain the difference between climate and weather.
   Climate is the average weather conditions in a place over 30 years or more. While the weather can change in just a few hours, climate takes hundreds,

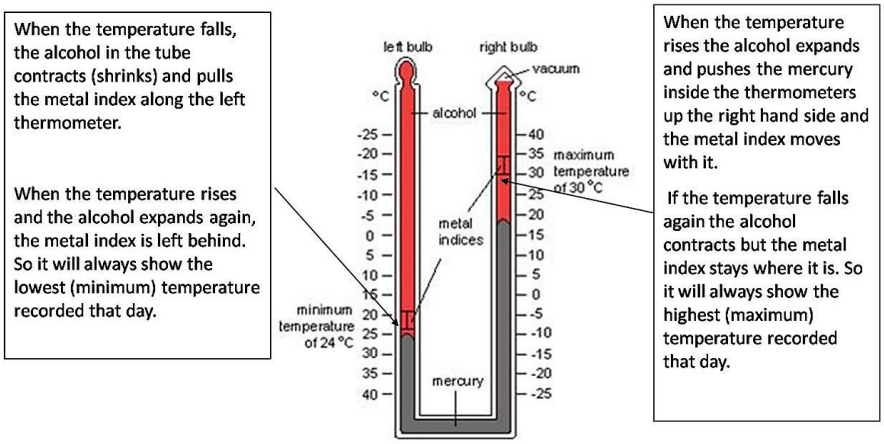
thousands, even millions of years to change. **Weather** describes conditions in the atmosphere that are happening right now.

2. How are the following elements of weather measured?
    a) Precipitation: measured using a rainguage
    b) Wind: measured either using a windsock, a wind vane or an anemometer.
    c) Sunshine: measured using a Campbell-Stokes sunshine recorder.
    d) Atmospheric pressure: Atmospheric pressure is measured by either and aneroid barometer or a mercury barometer.
    e) Humidity: measured by the hygrometer.

3. Give reasons for the following characteristics of the Stevenson's screen:
    a) Double roof with lid: keeps out rain water from entering the Stevenson's screen.
    b) White paint on the walls. Reduces heat from accumulating within the Stevenson's screen by reflecting away sun rays.
    c) 1.2 m Distance from the thermometers to the ground: eliminates any possible errors while measuring temperature, humidity and pressure.
    d) Louvres on the sides: Allows air to circulate freely in the Stevenson's screen.



4. Explain how a maximum and minimum thermometer works.



5. Draw and label the following weather instruments appropriately:
   a) The minimum and maximum thermometer.
   b) The anemometer.
   c) The barometer.
   d) The Campbell stokes sunshine recorder.
   e) The mercury barometer.
   f) The Stevenson's screen.

Note: For this question, look at the diagrams in the student's course book.

Case study 16 Pg. 150

Global warming and Climate change

Class debate

- Organize the class and form a debate on "oil as a great contributor to global warming". The debate should have two sides, the opposing side and the proposing side.

The debate should describe how global oil usage affects the environment leading to global warming. *The teacher can choose to assess the debate by awarding the two different side according to their performance.*

Group discussion

- Various methods or suggestions that the South Sudanese government can use to mitigate climate change.

a. Reduce emission: In order to effectively address global warming, the government of South Sudan should significantly reduce the amount of heat-trapping emissions that its citizens are putting into the atmosphere. As individuals, we can help by taking action to reduce our personal carbon emissions. But to fully address the threat of global warming, we must demand action from our elected leaders to support and implement a comprehensive set of climate solutions.

b. Stop deforestation: Tropical deforestation accounts for about 10 percent of the world's heat-trapping emissions. Reducing tropical deforestation can significantly lower global warming emissions and — together with efforts to reduce emissions from fossil fuels which plays an integral role in a comprehensive long-term solution to global warming. The government of South Sudan should come up with legislated laws to abolish deforestation and uphold afforestation.

c. Boosting energy efficiency: The energy used to power, heat, and cool our homes, businesses, and industries is the single largest contributor to global warming. Energy efficiency technologies allow us to use less energy to get the same—or higher—level of production, service, and comfort. This approach has vast potential to save both energy and money, and can be deployed quickly. The

government should educate citizens on this and provide energy saving apparatus to tis citizens.

d. Greening transportation: The transportation sector's emissions have increased at a faster rate than any other energy-using sector over the past decade. A variety of solutions are at hand, including improving efficiency (miles per gallon) in all modes of transport, switching to low-carbon fuels, and reducing vehicle miles traveled through smart growth and more efficient mass transportation systems.

e. Revving up renewables: Renewable energy sources such as solar, wind, geothermal and bioenergy are available around the world. Multiple studies have shown that renewable energy has the technical potential to meet the vast majority of our energy needs. The government of South Sudan can develop renewable technologies which can be deployed quickly, are increasingly cost-effective, and create jobs while reducing pollution.

f. Phasing out fossil fuel electricity: Dramatically reducing our use of fossil fuels—especially carbon-intensive coal—is essential to tackle climate change. There are many ways to begin this process. Key action steps include: not building any new coal-burning power plants, initiating a phased shutdown of coal plants starting with the oldest and dirtiest, and capturing and storing carbon emissions from power plants. While it may sound like science fiction, the technology exists to store carbon emissions underground. The technology has not been deployed on a large scale or proven to be safe and permanent, but it has been demonstrated in other contexts such as oil and natural gas recovery. Demonstration projects to test the viability and costs of this technology for power plant emissions are worth pursuing.

g. Exploring nuclear energy: Because nuclear power results in few global warming emissions, an increased share of nuclear power in the energy mix could help reduce global warming—but nuclear technology poses serious threats to our health due to emission of radiation from explosions caused by system failures.

h. Developing and deploying new low-carbon and zero-carbon technologies. Research into and development of the next generation of low-carbon technologies will be critical to deep mid-century reductions in global emissions. Current research on battery technology, new materials for solar cells, harnessing energy from novel sources like bacteria and algae, and other innovative areas could provide important breakthroughs.

i. Ensuring sustainable development: the countries of the world—from the most to the least developed—vary dramatically in their contributions to the problem of climate change and in their responsibilities and capacities to confront it. A

successful global compact on climate change must include financial assistance from richer countries to poorer countries to help make the transition to low-carbon development pathways and to help adapt to the impacts of climate change.

Exercise 12 Pg. 150

1. What is climate change? **Climate change** is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather within the context of longer-term average conditions.

2. What are some of the factors affecting the climate of a given area?

   a) Latitude or distance from the equator: Temperatures drop the further an area is from the equator due to the curvature of the earth. In areas closer to the poles, sunlight has a larger area of atmosphere to pass through and the sun is at a lower angle in the sky. As a result, more energy is lost and temperatures are cooler. In addition, the presence of ice and snow nearer the poles causes a higher *albedo,* meaning that more solar energy is reflected, also contributing to the cold.

   b) Altitude or height above sea level: Locations at a higher altitude have colder temperatures. Temperature usually decreases by 1°C for every 100 meters in altitude.

   c) Distance from the sea: Oceans heat up and cool down much more slowly than land. This means that coastal locations tend to be cooler in summer and warmer in winter than places inland at the same latitude and altitude.

   d) Prevailing winds: The prevailing wind is the most frequent wind direction a location experiences. When prevailing winds blow over land areas, it can contribute to creating desert climate. There are 3 major wind patterns found in the Northern Hemisphere and also 3 in the Southern Hemisphere. These are average conditions and do not essentially reveal conditions on a particular day. As seasons change, the wind patterns shift north or South.

   e) Topography; The Topography of an area can greatly influence our climate. Mountain ranges and forest covers are natural barriers to air movement. This may cause an area to have rain or lack rain. Areas near mountains have

a high amount of rainfall while areas with no tree covers or mountain ranges have prevailing dry conditions.

f) Effects of Geographical activities: The position of a town, city or place and its distance from mountains and substantial areas of water help determine its prevailing wind patterns and what types of air masses affect it. Coastal areas may enjoy refreshing breezes in summer, when cooler ocean air moves ashore. Places near lakes and other large waterbodies experience a *convectional* type of rainfall characterized by thunderstorms. Similarly areas on the lee ward side of mountains have a *relief* type of rainfall while areas on the windward side of the mountain experience limited amount of rainfall.

g) Surface of the Earth: The amount of sunlight that is absorbed or reflected by the surface determines how much atmospheric heating occurs. Darker areas, such as heavily vegetated regions, tend to be good absorbers; lighter areas, such as snow and ice-covered regions, tend to be good reflectors. The ocean absorbs and loses heat more slowly than land. Its waters gradually release heat into the atmosphere, which then distributes heat around the globe.

h) Climate change over time: Cold and warm periods punctuate Earth's long history. Since the turn of the 20th century, temperatures have been rising steadily throughout the world. But it is not yet clear how much of this global warming is due to natural causes and how much derives from human activities, such as the burning of fossil fuels and the clearing of forests.

3. Definition of terms:

a) Greenhouse effect: is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by *greenhouse gases*. Greenhouse gases include water vapour, carbon dioxide, methane, nitrous oxide, ozone and some artificial chemicals such as chlorofluorocarbons (CFCs).

b) Global warming: also referred to as climate change, is the observed century-scale rise in the average temperature of the Earth's climate system and its related effects.

4. What are some of the measures that can be useful in preventing global warming?

- Reduce carbon dioxide emissions by developing zero carbon and low carbon technologies such as the use of solar cells.
- Stopping deforestation and encouraging afforestation on area with low tree coverage in order to reduce carbon dioxide oxide levels in the atmosphere.
- Greening transportation by modifying vehicles to use ecofriendly fuels such as electricity.
- Exploring nuclear energy instead of coal energy.
- Using renewable energy such as solar and wind.

Unit 7: Photography and Map interpretation

Number of topics

3 topics, 9 subtopics

Approximated number of lessons

4-5 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners to use the lesson to understand the importance of photography in Geography. They are to observe different photographs provided, classify them in accordance to the categories of photographs and interpret the objects within the photographs by determining an appropriate title, estimating the time the photo was taken, estimating the direction of the photographer among other tasks.

Learners should use a range of resources such as maps and atlases to identify basic land features e.g. forestry, rivers/ streams, hills, valleys, plus man-made features such as settlement patterns, plantations, roads and channels etc.

They should sort and analyze practically the relationship between aspects of physical and human geography based on the maps and atlases.

Knowledge and understanding

- Identify basic land features from the maps and photographs.
- State the relationship between aspects of physical and human geography based on maps and atlases.
- Explain the trend and development of these physical features over time.

Key Inquiry questions

a) What do you understand by map interpretation?
b) What tools and methods can be used in map interpretation?
c) How can we describe the relationship between physical geography and human geography as far as maps and atlases are concerned?
d) How do you explain the trend and development of these features overtime?

Skills to be acquired

- Use a scaled ruler and a protractor to find distance and bearing on a map.
- Analyze physical and human features on a map.
- Observe varieties of field maps, reading contour lines, maps, atlases and photographs.
- Be able to use tape measures and rulers to measure something to the nearest unit.
- Draw and interpret maps.

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in analyzing features and characteristics of different types of maps.

Attitudes

- Value and appreciate different types of maps and photographs.

Link to other subjects

- *Environment and sustainability:* mathematics and physics through measurement of distances in maps using different scales and finding the compass bearing of a point in the map.

Reading and Understanding Photographs and Maps

What is expected of the teacher?

In this unit, the teacher is supposed to do the following:

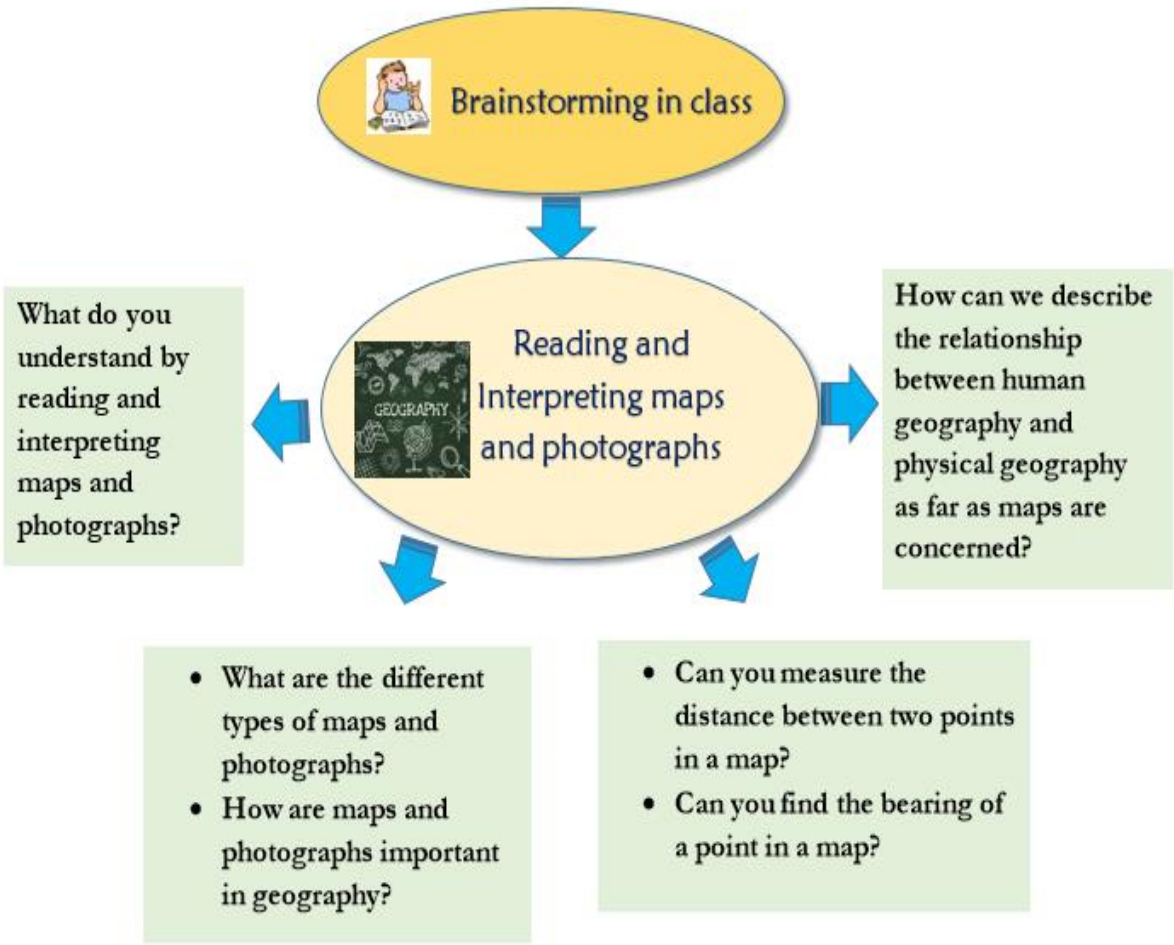
a) Explain the importance of photography in Geography.
b) Describe the different parts of a photograph as well as the different types of photographs.
c) Explain to the learners the different ways of reading and interpreting photographs.
d) Explain the essential features of a map.
e) Explain the different types of maps, their characteristics and usage.
f) Help the learners understand how to measure distances and find bearing of points in the maps.
g) Help the learners describe the relationship between physical geography and human geography in maps. In this case, reading contour lines to find the altitude of relief features and interpreting symbols and colours used in maps.
h) Guide the learners to perform various comprehensive activities within the course book.

Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Progress checks, case studies and comprehensive activities in the book are paramount for the student to understand various practical activities within the course book. The teacher should make sure that the learners have access to the following resources: map extracts, geometrical sets, and atlases.

Brainstorming

Before introducing the unit to the learners. Engage the learners in a discussion to evaluate their comprehension on map reading and interpretation. This will make them eager to learn about the new topic introduced. It will also make them attentive throughout the lesson. Use the following information.



Resources required in this unit

This unit involves a lot of practical work. The teacher should ensure that each student is equipped with the resources provided in the list. Liaise with the school's authority for the provision of these items.

Topic/ subtopic	Requirements
Topic 1 (photography in geography)	A variety of geographical photographs (photos of landscapes, human settlement, wildlife, drainage etc.)
Topic 2 and 3 (map reading and interpretation	Map extracts or copies of atlases.
Finding distance between two points on a map and the location and position of a point in a map- Comprehensive activity 12 Pg. 176 and Exercise 15 page 185-186	Pieces of white thread and a geometrical set for each student.

Additional notes on Photography in Geography

Why do Geographers use photographs?

Geographers use a wide variety of tools in their studies of environments and communities. These tools assist them to obtain and record more accurate results. In cases where recording data in a written format is too time consuming and not accurate, geographers often rely on a photograph to document the information. Photographs have a number of advantages. They can capture extraordinary detail which lasts forever and it takes less than a second to capture a single image. Photographs are relatively inexpensive to create and it is simple to compare two photographs from different periods in time or from different parts of the world.

Advantages and disadvantages of different types of photographs

Ground level photographs/ horizontal photographs

Advantages of ground level photographs

- They show the ground in great details.
- Ground photography is less expensive compared to types of photograph like aerial photograph also it is quick method of storing geographic information.
- It can replace a great deal of verbal description.
- It can be used in field sketching.
- It is used for geographical studies for example study of climate.

Disadvantages of ground level photographs

- It is difficult to determine their scale unless one who takes the picture knows the size of the object
- They are not selective, that is all objects found in the face of the camera are recorded even if they are not needed.
- Objects on the **fore ground** blocks visibility of the objects in the middle and back ground. It covers small area compared to other types of photography

Oblique photographs

Advantages of oblique photographs

- They show more of an area than ground level photographs, since their view is not obscured by hills, trees or houses.
- Oblique photographs can also easily be assessed and understood. The perspective of an oblique photograph is similar to that of a conventional (ground-level) photograph, so the physical and cultural features of the landscape are still recognizable. This is unlike vertical aerial photographs which are presented from a map-like perspective.
- Another advantage of oblique photographs is that they do not require the aircraft to fly directly overhead the area being photographed. It provides a current pictorial view of the ground that no map can.

Disadvantages of oblique photographs

- A major disadvantage of an oblique photograph is that scale is inconsistent. This means that while distances can be calculated in the foreground, according to the provided scale, distances which are closer to the horizon would be completely inaccurate if calculated using the same scale.

Aerial Photographs

Advantages of aerial photographs

- It provides a current pictorial view of the ground that no map can.
- It is more readily obtained. The photograph may be in the hands of the user within a few hours after it is taken; a map may take months to prepare.

Disadvantages of aerial photographs

- Ground features are difficult to identify or interpret without symbols and are often obscured by other ground detail as, for example, buildings in wooded locations.

- Detailed variations in the terrain features are not readily apparent without overlapping photography and a stereoscopic viewing .Because of a lack of contrasting colors and tone, a photograph is difficult to use.
- It requires more training to interpret than a map.

Importance of Photographs in Geography

- It gives quick information about an area than a map
- Photograph can work instead of the map i.e. it is used to determine features formed on landscape such as man-made features like roads, houses and natural features like hills mountain, oceans etc.
- It does not need trained eyes to identify features because all features are shown as they are
- Photograph is used to store information for future generation
- Photograph replace a great deal of verbal description and therefore they save time
- It is used to show different geographical events, for example one can determine the climate of the area by looking at the crops and relief shown in photograph of that area

Answers

Exercise 13 Pg. 156

1. What do you understand by the term photography?
   Photography the art or process of capturing images, either on light-sensitive film or electronically in digital form, from which viewable pictures can be produced.

2. Using the sketch provided, describe the different parts of a photograph.
   The following are the parts of a photograph:
   - Background the area farthest from the camera.
   - Foreground: this is the area nearest to the camera.

- Middle ground: this is the area between the background and the foreground, which is at middle distance from the camera.

Each of the three parts of the photograph can further be sub-divided into three parts to give nine combinations which form the nine minor parts of the photograph namely:

- Left background, center background and right background.
- Left middle ground, center middle ground and right middle ground.
- Left foreground, center foreground and right foreground.

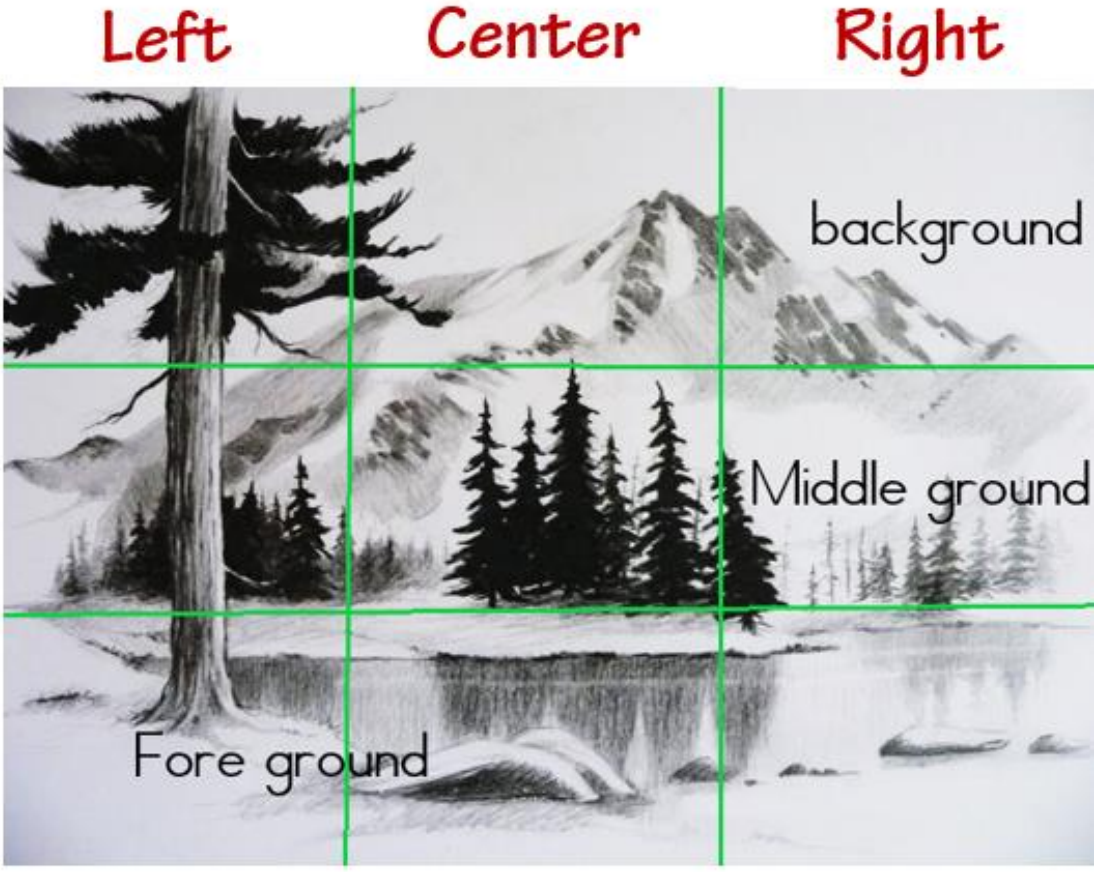


Figure 3. Parts of a photograph (refer to Exercise 13 Page 144)

3. Differentiate the following terms:

a) Horizontal photographs and oblique photographs

Ground level photographs/ horizontal photographs are taken when a camera is held level to the ground. When a ground photograph is taken, the axis of the camera is placed horizontally toward the object on the other hand, **oblique photographs** are taken from a high point, which is at an angle neither horizontal (ground level photograph) nor perpendicular (vertical aerial photograph) to the area being photographed. This angle is often referred to as a **slope.**

b) High oblique photographs and low oblique photographs.

- **Low oblique photographs**: These are taken when the photographer is standing in elevated ground, such as top of a hill, building or cliff, and holds the camera at an angle pointing towards the lower ground. The photograph can also be taken when the photographer is standing at the bottom of an elevated ground, with the camera pointing towards the higher ground.
- **High oblique photographs:** these photographs are taken from the sky with the camera tilted at an angle towards the ground. The photographer may take the photograph from a helicopter or low-flying airplane. These photographs cover quite a large area of land.

c) Aerial photographs and oblique photographs.

Oblique photographs are photographs taken when a camera is slanting at an angle less than 90°. They are taken when the photographer is standing on an elevated ground and hold the camera on an angle towards the lower ground. They normally cover the horizon. On the other hand **aerial photographs** are photographs taken from the aircraft with the camera directly above the object pointing vertically to the ground. Only the top view is seen. Instruments used to capture pictures are called air crafts or the satellites.

4. Identify the types of photographs provided. (refer to the photos on page 144 of the student's course book)
    a) Ground level/ horizontal photograph of a landscape.
    b) High oblique photograph of a city (Kuala Lampur, Petronas tower, Malaysia) taken from inside a building.

Case study 17 Pg. 160

Reading and interpreting photographs

Note: The teacher is supposed to organize learners in pairs and guide them through the task.

1. Provide an appropriate title for the photograph provided: Lopit hills, Eastern Equatoria, Torit district, South Sudan.
2. Identify and describe the following physical and human features in the photograph provided:
    a) Relief, Drainage, vegetation, climate and soil: from the photograph provided, a range of hills are clearly visible at the background and the middle ground (Lopit Hills), a river is also clearly visible between dense

forests. The area cover in the photograph seems to have favorable amount of rainfall. As per the dense green vegetation, the area covered in the photograph tends to have fertile soils.

b) Agriculture, settlement, transport and communication, industrial and mining activities: there are no visible signs of Human settlement within the photographs however if any, the people living around the area covered within the photograph are likely to be farmers or fishermen. There is no visible infrastructure hence no activity within the area. Lastly, people living within the area may travel by boat through the river.

3. How can you classify the photograph provided? Justify your answer.

The photograph provided can be classified as a **high oblique photograph** since it is likely to be taken from the sky with the camera tilted at an angle towards the ground. The photographer may have taken the photograph from a helicopter or low-flying airplane. The photograph covers quite a wide area of land.

Guidelines to Comprehensive Activity 12 Pg. 176

Guide the learners in

a) Measuring the distance between any two points in the map extracts you have provided.

Exercise 14 Pg. 176

1. The qualities of a good map.

A good map should have the following elements:

a) **A Key:** Used to interpret symbols and signs found on a map. They appear in a box at one of the bottom corner of the map.

b) **Title:** Used to show what's map is all about. This is the heading of the map. It can appear on top of the map or anywhere else.

c) **North direction**; this is an indication of the north direction. It shows where north is and by knowing north one can know the direction and bearing of the place.

d) **Margin;** this is a boundary or limit around the map. It gives or shows the reader and interpreter the end of the map.

e) **Publisher and date publication;** this shows when the map was produced and a publisher.

f) **Latitude and Longitude / Grid reference**: used to locate the actual location of place on the map.

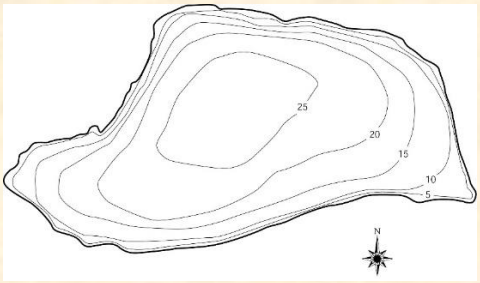
g) **A scale**; It shows the relationship between map distance and the actual ground distance.

2. Differentiate between topographic maps and statistical and distribution maps.

Topographic maps are small-scale drawings of a part of the earth's surface. They show the location of places, the landscape of regions and the cultural feature of place which include the distribution of roads, railways, cities, towns, dams and other structures built by man. On the other hand **statistical and distribution maps** are the type of maps which have been made with the help of exact statistics. These maps show such things as distribution of rainfall, temperature, pressure, vegetation, crops, minerals and many other things.

Comprehensive Activity 13 Pg. 180

1. Calculate the altitude of the region in the map.



Answer:

The altitude of the region is **25m above sea level**. The cross-sectional diagram of the region should represent a hill with its peak being 25m and its base at 5m above sea level.

Exercise 15 Pg. 185-186

1. Differentiate between human and physical geography.

   Physical geography looks at the natural processes of the Earth, such as climate and plate tectonics while **human geography** looks at the impact and behaviour of people and how they relate to the physical world.

2. How can we describe the relationship between physical and human geography as far as maps and atlases are concerned?

   In maps, the two branches of geography are represented by the use of:

   a) **Colours** to represent physical features such as rivers, oceans, forest covers and vegetation etc.
   b) **Symbols:** to represent distribution of manmade features such as road, cities, towns etc.
   c) **Graphs and pie charts** to analyze and give information of a particular research based of human and natural activities. Such information may include, distribution of rainfall in a region, Statistics on human economic activity including mining, agriculture, transportation etc.
   d) **The usage of contour lines:** to represent the distribution of relief features in regions represented on the map. The relief features may include hills, mountains, plateaus, depressions and basins.

3. Refer to the map on page 185 of the student's course book.

   a) The map given is a statistical and distribution map in that it shows Africa's economic productivity.
   b) Colors and symbols are representation of real objects in the map.

4. Use the map below to answer the questions that follow:

   a) Measure the distance between the points as indicated on the map on the activity (refer to page 186 of the student's course book) convert the measurements (to the nearest centimeter) to comply with the scale of 1:25000.

b) Use a ruler and a protractor to find the bearing of the two points as indicated on the question in the course book. Compare your answer with that of the learners.

c) This map is a topographical map. It shows all the features within Nairobi city.

d) Examples of additional data that could be provided include:

   i. The number of people visiting Uhuru Park in a day.

   ii. The number of drinks red bull shop distributes to other localities.

   iii. Number of travelers boarding a train at the railway station, among others.

Note: Guide the leaners in making imaginary graphs and pie charts for the above information.

Unit 8: The Environment and Development

Number of topics

2 topics, 6 subtopics

Approximated number of lessons

4-5 lessons each with an estimated time of one hour

What are the learners expected to learn in this unit?

Learners should explore the relationship between the environment and development. They should consider the interaction between poverty and environmental degradation and their impact on productivity of resources.

Learners should consider basic issues related to sustainable development and environmental accounting. The balance between economic growth and environmental preservation, meeting the needs of present generation without compromising the needs of the future generation.

They should differentiate the relationship between poverty and the environment, and examine critically the effect of high fertility on poverty, rural development and environment and discuss the effect of urban development on the environment and discuss the effect of urban development on the environment.

They should consider the strain on existing water supplies, sanitation, housing, health, food and other issues.

Knowledge and understanding

- Understand the relationship between development and environmental degradation.
- Create a balance between economic growth and environmental preservation.
- Understand the value of preserving the present environment for the benefit of future generation.
- Explain the relationship among environment, economic and high fertility on urban and rural population.
- Explain the relationship among environment, economic growth and high fertility on urban and rural population.
- Analyze the constraints exerted upon urban areas as a result of urbanization.

Key Inquiry questions

a) What are the effects of industrialized economic development on the environment?
b) How can the balance between economic growth and environmental preservation be attained?
c) How can the present environment be preserved for the benefit of the future generation?
d) How does high fertility in developed countries lead to poverty?

Skills to be acquired

- Suggest ways and means of environmental protection.
- Understand the effects of high fertility and population growth on rural urban areas.
- Investigate the factors that would lead to environmental destruction in urban and rural areas

Competencies to be developed

- *Critical thinking and cooperation:* by working in groups in analyzing features.

Attitudes

- Appreciate the importance of environmental protection.
- Appraise economic growth in terms of sustainable benefit.

Link to other subjects

- *Environment and sustainability:* environmental conservation and sustainable development.

Understanding the relationship between Development and the Environment.

What is expected of the teacher?

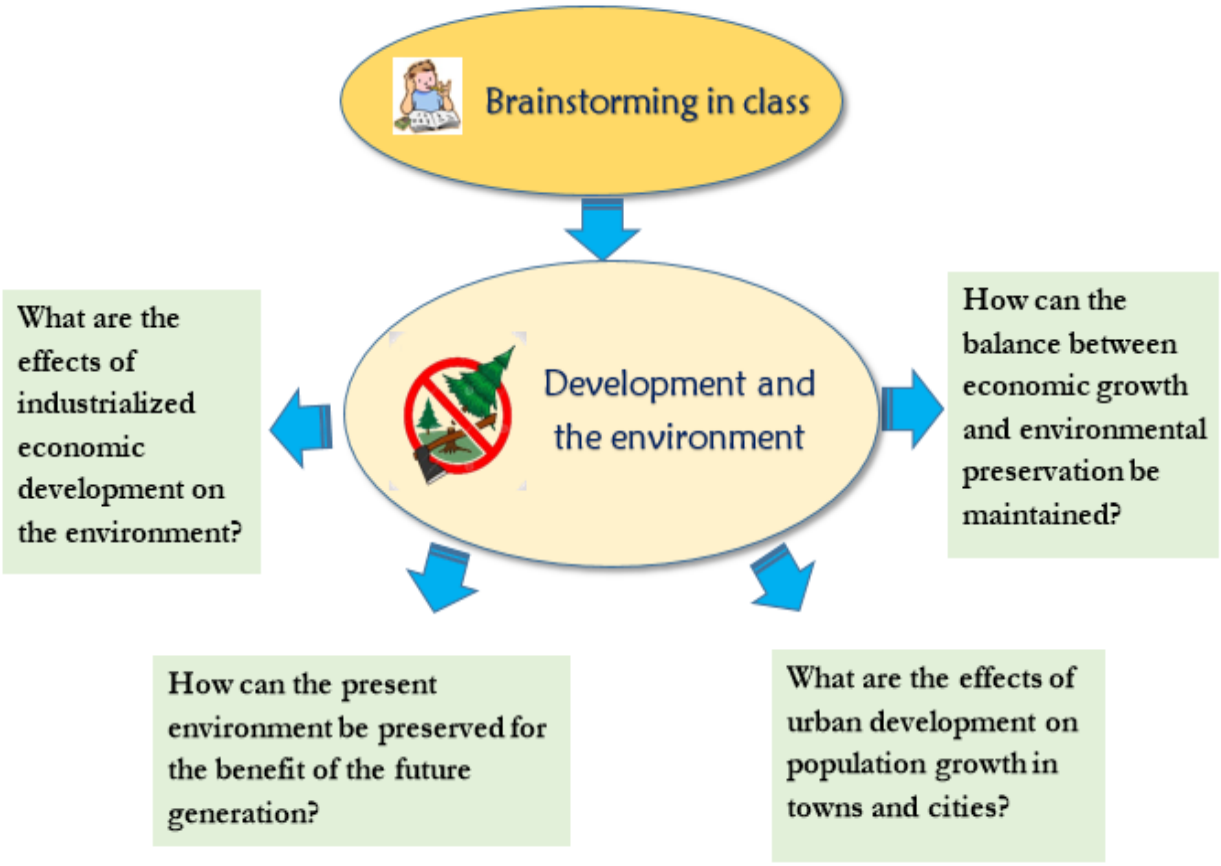
In this unit, the teacher is supposed to do the following:

a) Help the student understand the need for creating a balance between economic growth and environmental preservation.
b) Define and explain environmental degradation and its causes and effects respectively.
c) Explain the concept of sustainable development to the learners and how it can be an effective tool in curbing environmental degradation.
d) Guide the learners through the activities within the unit. **Refer to Comprehension activity 14 (pg. 202) and field observation 1 (pg. 203)** these activities are designed to engage the learners and help them understand the concepts of **environment conservation and sustainable development.**

Note: use the detailed notes within the student's course book to familiarize yourself with individual topics and make notes before the lessons.

Brainstorming

Before introducing the unit to the learners. Engage the learners in a discussion to evaluate their comprehension on the effects of industrialized economic development on the environment. This will make them eager to learn about the new topic introduced. It will also make them attentive throughout the lesson. Use the following information.



Resources required in this unit

For an effective learning experience, the following resources should be provided to the learners in order to cover the various subtopics, activities and exercises provided within the student's course book. Liaise with the school's authority for the provision of these items. If not possible, come up with alternative lesson plans based on the topic coverage.

Subtopic	Requirements
Field observation 1 Page 203.	Liaise with the school's authority to organize a field observation trip. Check out the explanation on page 120 on this book.

Field Observation 1

Observing the environment near your school

In groups take a walk in a neighboring town or market near your school. And record your observations in the table below:

What is the name of the market/ town you are visiting?
Are there any poorly disposed waste around the place you are visiting?
Are there any tree plantations near the market/ town?
Are there any industries nearby?
Are there any signs of environmental degradation within your place of visit? If yes, what are they?
What are some of the ways or methods that the community living in your place of visit can use to eliminate non- biodegradable waste disposal?

Figure 4. Field observation 1 Page 182

Answers

Case study 18 Pg. 199

The effects of environmental degradation on tourism

Note: Organize the learners in random groups and let them tackle the task.

Figure 5. Gazelles grazing at Nairobi National Park, Nairobi- Kenya.

a) **Environmental degradation**: is the disintegration of the earth or deterioration of the environment through consumption of assets, for example, air, water and soil.

b) **Threats posed on the national park pictured above:**

   i. **Poaching:** the animals in the park face a possible threat of poaching from cartels in the quest of game meat and tasks and horns which are perceived as valuable.

   ii. **Negative government legislation:** if the city next to the national park is overpopulated, government officials may be forced to cut into the national park's space for expansion purposes. This may threaten the lives of the animals by destroying the resources in their habitat.

iii. **Pollution:** pollution from industries within the city, smoke emitted from the overflowing traffic to and fro the city and toxic waste disposed poorly are possible threats that may cause harm to the animal species within the park.

Comprehensive Activity 14 Pg. 202

Class debate:

"Development has led to poverty in low income countries"

Organize the entire class into two key divisions:

i. A section of the class should oppose the motion presented.
ii. A section of the class should agree with the topic presented.

Each section participating should come up with concrete and well explained answers to earn points. The teacher can make the activity interesting by awarding the best section with points (out of a possible 100%).

The following could be some of the answers expected

The proposers (agreeing side)	The Opposers (disagreeing side)
It is true that development has in some point led to poverty in low income countries. Most governments have been clearing up natural resources in the name of developing infrastructure. **Unsustainable development** can lead to grave consequences such as a) Desertification, b) Water shortage, c) Ruinous agricultural practices with poor yield leading to lack of food. d) Destruction of the natural ecosystem which may be lead to lack of biodiversity. Seemingly unsustainable development is based on **greed** and **corruption**. This may also lead to civil	Sustainable development on the other hand can be a solution to preventing poverty. Sustainable development focuses on the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development involves preserving the environment for other species as well as for people. This can be achieved by: a) Sensitizing the public on the importance of protecting the environment. b) Using renewable energy instead of fossil fuel.

clashes and war. Poverty is as a result of loss of natural resources for survival.	c) Coming up with government legislations against deforestation and encouraging afforestation.

Group discussion

Ways of conserving and protecting the environment

Organize the learners in groups and instruct them to discuss on the ways to conserve and protect the environment.

The following are some of the ways of conserving the environment:

a) Reduce the use of aerosol sprays which emit chlorofluorocarbons in the atmosphere, leading to the destruction of the ozone layer.
b) Use eco-friendly fuels. This may be achieved by using more efficient technologies in the transport industry such as using electricity instead of fossil fuels such as leaded petroleum and diesel.
c) Use renewable energy such as wind, solar and geothermal to reduce emission of carbon in the atmosphere from industrial smoke and fumes.
d) Recycling, reusing and reduce the usage of plastic materials.
e) Planting trees to replace the ones that have been cut.
f) Filtering waste from industries before draining them. This is to remove any toxic chemicals from entering rivers and lakes.

Field Observation 1 Pg. 203

Observing the environment near the school

The teacher is supposed to organize the class in different groups and instruct the learners to observe the environment around the school.

During their visit, they are supposed to fill the questionnaire below:

What is the name of the market/ town you are visiting?
Are there any poorly disposed waste around the place you are visiting?
Are there any tree plantations near the market/ town?
Are there any industries nearby?
Are there any signs of environmental degradation within your place of visit? If yes, what are they?
What are some of the ways or methods that the community living in your place of visit can use to eliminate non- biodegradable waste disposal?

After the activity, collect the questionnaires from the learners and evaluate their answers. Help them understand the reason behind their answers by engaging them in a discussion.

Exercise 16 Pg. 204

1. Definition of terms:
    a) Environment: the surroundings or conditions in which a person, animal, or plant lives or operates.
    b) Sustainable development: Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
    c) Environmental conservation: is the act of *conserving* or saving our natural resources through careful management.

2. **Effects of urban development and population growth on the towns and cities:**
    a) **Positive effects of urbanization:** Urbanization yields several positive effects if it happens within the appropriate limits. Some of the positive implications of urbanization therefore include creation of employment opportunities, technological and infrastructural advancements, improved transportation and communication, quality educational and medical facilities, and improved standards of living. However, extensive urbanization mostly results in adverse effects. Below listed points are few of them.
    b) **Housing problems:** Urbanization attracts people to cities and towns which lead to high population increase. With the increase in the number of people living in urban centers, there is continued scarcity of houses. This is due to insufficient expansion space for housing and public utilities, poverty, unemployment, and costly building materials which can only be afforded by few individuals.
    c) **Overcrowding:** Overcrowding is a situation whereby a huge number of people live in a small space. This form of congestion in urban areas is consistent because of overpopulation and it is an aspect that increases day by day as more people and immigrants move into cities and towns in search of better life. Most people from rural or undeveloped areas always have the urge of migrating into the city that normally leads to congestion of people within a small area.
    d) **Unemployment:** The problem of joblessness is highest in urban areas and it is even higher among the educated people. It is estimated that more than

half of unemployed youths around the globe live in metropolitan cities. And, as much as income in urban areas is high, the costs of living make the incomes to seem horribly low. The increasing relocation of people from rural or developing areas to urban areas is the leading cause of urban unemployment.

e) **Development of slums:** The cost of living in urban areas is very high. When this is combined with random and unexpected growth as well as unemployment, there is the spread of unlawful resident settlements represented by slums and squatters. The growth of slums and squatters in urban areas is even further exacerbated by fast-paced industrialization, lack of developed land for housing, large influx of rural immigrants to the cities in search of better life, and the elevated prices of land beyond the reach of the urban poor.

f) **Water and sanitation problems:** Because of overpopulation and rapid population increase in most urban centers, it is common to find there are inadequate sewage facilities. Municipalities and local governments are faced with serious resource crisis in the management of sewage facilities. As a result, sanitation becomes poor and sewages flow chaotically, and they are drained into neighboring streams, rivers, lakes, or seas. Eventually, communicable diseases such as typhoid, dysentery, plague, and diarrhea spread very fast leading to suffering and even deaths. Overcrowding also highly contributes to water scarcity as supply falls short of demand.

g) **Poor health and spread of diseases:** The social, economic and living conditions in congested urban areas affects access and utilization of public health care services. Slum areas in particular experience poor sanitation and insufficient water supply which generally make slum populations susceptible to communicable diseases. The environmental problems such as urban pollution. Also cause many health problems namely allergies, asthma, infertility, food poisoning, cancer and even premature deaths.

h) **Traffic congestion:** When more people move to towns and cities, one of the major challenges posed is in the transport system. More people means increased number of vehicles which leads to traffic congestion and vehicular pollution. Many people in urban areas drive to work and this creates a severe traffic problem, especially during the rush hours. Also as the cities grow in dimension, people will move to shop and access other social needs/wants which often cause traffic congestion and blockage.

i) **Urban crime:** Issues of lack of resources, overcrowding unemployment, poverty, and lack of social services and education habitually leads to many social problems including violence, drug abuse, and crime. Most of the crimes such as murder, rape, kidnapping, riots, assault, theft, robbery, and hijacking are reported to be more prominent in the urban vicinities. Besides, poverty related crimes are the highest in fast-growing urban regions. These acts of urban crime normally upset the peace and tranquility of cities/towns.

3. **Effect of industrialized economic development on the environment.**

- The immediate result is in the gradual disappearance of many natural resources, the pollution of land, water and air.
- The increase in vehicular traffic, launching of space ships and rockets by competing nations, the incessant working of machines in factories have brought in noise-pollution and dust and smoke.
- The general dirty and unhealthy conditions in and around the industrial sites have affected human health and happiness. Diseases, unheard of before, are spreading far and wide.
- There has been instances of child labor in factories.
- The exploitation of the poor by the rich has increases the crime-rate, isolation and sense of loneliness.
- The gradual displacement of manpower in industries is ultimately leading to unemployment.

5. **How can the present environment be preserved for the benefit of the future generation?**

a) Reduce the use of aerosol sprays which emit chlorofluorocarbons in the atmosphere, leading to the destruction of the ozone layer.
b) Use eco-friendly fuels. This may be achieved by using more efficient technologies in the transport industry such as using electricity instead of fossil fuels such as leaded petroleum and diesel.
c) Use renewable energy such as wind, solar and geothermal to reduce emission of carbon in the atmosphere from industrial smoke and fumes.
d) Recycling, reusing and reduce the usage of plastic materials.
e) Planting trees to replace the ones that have been cut.
f) Filtering waste from industries before draining them. This is to remove any toxic chemicals from entering rivers and lakes.

6. **Effects of pollution to the environment:**

Pollution, in whatever form, whether it is air, water, land or noise is harmful for the environment. Air pollution pollutes the air that we breathe which causes health issues. Water pollution degrades the quality of water that we use for drinking purposes. Land pollution results in degradation of earth's surface as a result of human activities. Noise Pollution can cause irreparable damage to our ears when exposed to continuous large sounds like honking of vehicles on a busy road or machines producing large noise in a factory or a mill.

Glossary

1. Vulcanicity: This is the processes by which molten materials from the mantle (magma) are intruded into the Earth's crust but also extruded from the Crust.
2. Volcanicity: Refers to the ways by which magma is intruded into the earth's crust.
3. A fault, in geographical/geological terms, is a fracture or rupture in the rock strata due to strain in which displacement is observable.
4. Faulting is the movement responsible for the formation of a fault may operate in vertical, horizontal or any other direction.
5. The source or headwaters of a river or stream is the furthest place in that river or stream from its estuary or confluence with another river, as measured along the course of the river.
6. Tributary or affluent is a stream or river that flows into a larger stream or main stem (or parent) river or a lake.
7. A confluence, where two or more bodies of water meet together, usually refers to the joining of tributaries.
8. A meander is one of a series of regular sinuous curves, bends, loops, turns, or windings in the channel of a river, stream, or other watercourse
9. Levee: an embankment alongside a river, produced naturally by sedimentation or constructed by man to prevent flooding.
10. An oxbow lake is a U shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free-standing body of water.
11. A river delta is a landform that forms from deposition of sediment carried by a river as the flow leaves its mouth and enters slower-moving or standing water.
12. An estuary is the tidal mouth of a large river, where the tide meets the stream.
13. A butte is like a plateau but its top is a bit more rounded.
14. A mesa is a plateau with quite a flat top.

15. An ecosystem is comprised of all the non-living elements and living species in a specific local environment.
16. Tundra: a vast, flat, treeless Arctic region of Europe, Asia, and North America in which the subsoil is permanently frozen.
17. Infant mortality rate: The number of death from 0-2 years.
18. Child mortality rate: Number of death of learners aged between 1-5 years per 1000 live birth.
19. Adult mortality rate: Number of adults dying per 1000 of the total population.
20. Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years).
21. Topography is a term used to describe all physical features of a given area.
22. Physical geography: a branch of geography that looks at the natural processes of the Earth, such as climate and plate tectonics.
23. Human geography: a branch of geography that looks at the impact and behaviour of people and how they relate to the physical world.
24. Environmental geography. The main area of geography that looks at the connection between physical and human geography.
25. A Map Legend is a key to all the symbols used on a map.
26. A contour line is a line joining points of equal elevation on a surface.
27. Environmental degradation is the disintegration of the earth or deterioration of the environment through consumption of assets, for example, air, water and soil.
28. Landfills: The large heaps of waste disposed outside of major towns.
29. Sustainable development: This is development which meets the needs of the present without compromising the ability of future generations to meet their own needs.

References

Benaiah Yongo- Bure (2010), Economic Development of Southern Sudan, University Press of America, New York.

Dr. Terry Marsh (2015) Map reading skills, Pathfinder guides.

Emma Griffin (2010) A short History of British Industrial Revolution, Palgrave Macmillan, New York.

Edward Aguardo and James .E .Burt (1999) Understanding weather and climate 4th Edition, Prentice Hall, New Jersey, United States of America.

Francisco Gutierrez and Mateo Gutierrez (2016) Landforms of the Earth, an Illustrated Guide, Springer International, Switzerland.

Gordon Dickinson and Kevin Murphy (1998), Ecosystems, Routledge, New York.

Jose Goldemberg and Oswaldo Lucon (2010) Environment and Development, Earthscan, United Kingdom.

M.H. Fulekar, Bhawana Pathak, R. K Kale (2013) Environment and Sustainable Development, Springer, India.

Robert Davidson (2008), Reading Topographic Maps, Retrieved on 28th November 2017 from www.mapreading.com

Sophie and Max Lovell-Hoare (2013), South Sudan, 1st Edition, The Bradt Travel Guides, United Kingdom and Globe Pequot Press, United States of America.

Notes

Notes

Notes